PUBLIC WORKS

Mar.
1957

CITY, COUNTY AND STATE

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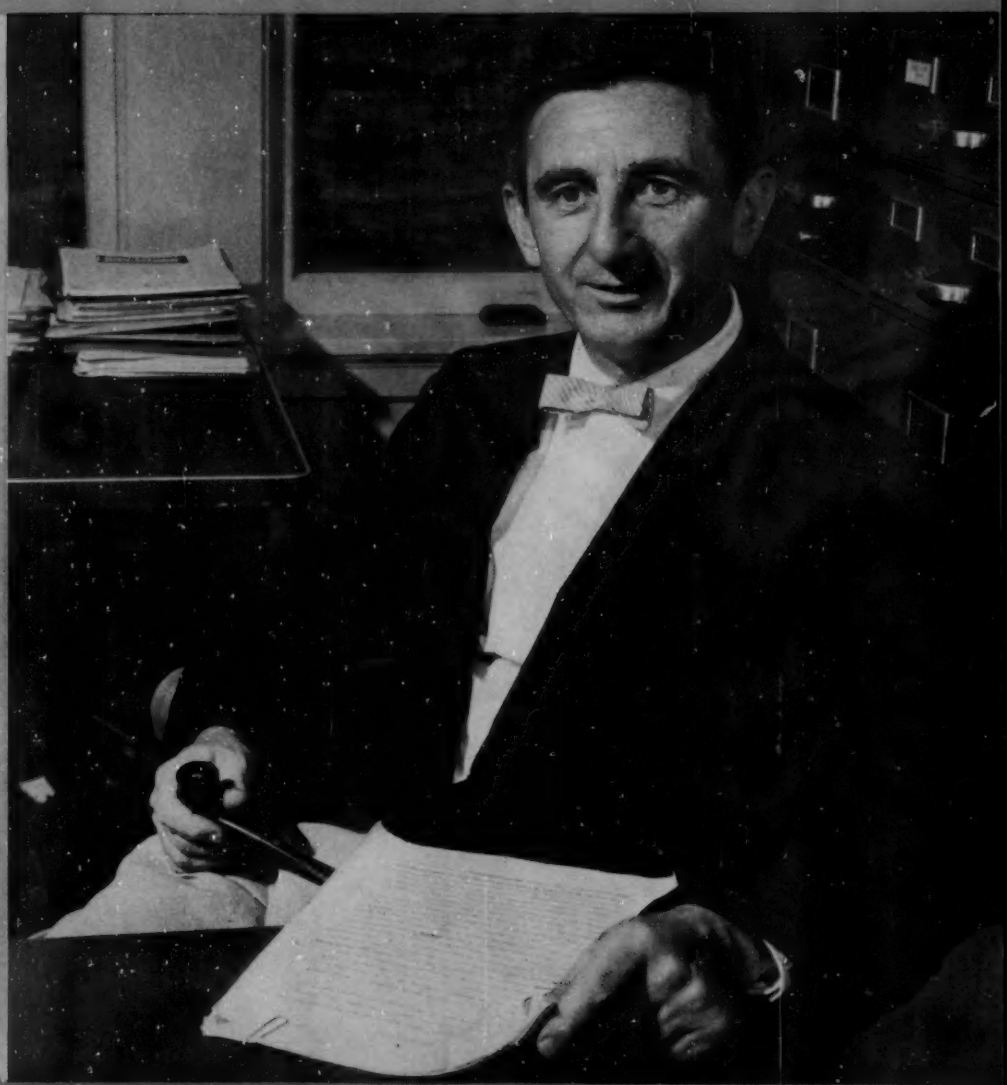
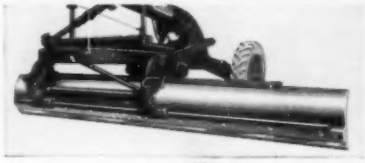
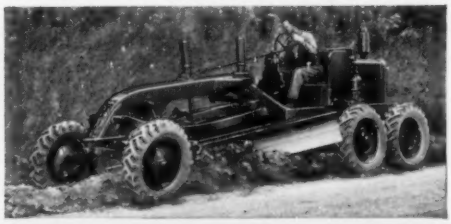


Gerard A. Rohlich is Professor of Civil Engineering, University of Wisconsin. A registered engineer, he has served as consultant on waste treatment and is active in research. More data on page 22.

When You Want ... THE MOST GRADER for the least money.



GALION Model 503 MOTOR GRADER



STANDARD FEATURES

- Positive, 4-wheel tandem drive.
- Hydraulic controls.
- High-clearance front axle.
- Gasoline engine — 50 h.p. (Diesel engine available).
- Four forward speeds, 2.3 to 20.4 m.p.h.; reverse 3.38 m.p.h.
- Front and rear tires 7.50 x 20 (8.25 x 20 available).

PERFORMANCE-BOOSTING ATTACHMENTS AVAILABLE

- Hydraulic shiftable moldboard.
- Hydraulic circle turn.
- Leaning front wheels.
- Windrow eliminator.
- Stand-up height steel cab with full-view safety glass.
- Front-positioned hydraulic scarifier.
- "V" snow plow — independently operated.
- Bulldozer — independently operated.

Write for literature.

A ONE-MAN, ONE-MACHINE MAINTENANCE DEPARTMENT

The Galion Model 503 Motor Grader is a high-quality, high-performance grader at a low-budget price. It is especially designed to meet the requirements of Contractors, Federal Agencies, States, Counties, Townships, Cities, etc.; also for maintaining haul roads in the timbering, mining, and petroleum fields.

On new construction there are many lighter types of work on which the Galion 503 will save thousands of dollars in investment and operation over what it costs to do the same work with heavier graders.

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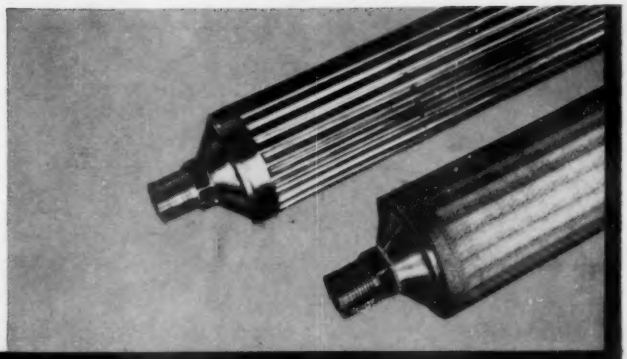
The only air diffuser that offers all the advantages of low cost cleaning, lower head loss over the entire range of air rates, consistent air rate to each tube, uniformity of fine bubble diffusion over entire surface to provide maximum air contact.



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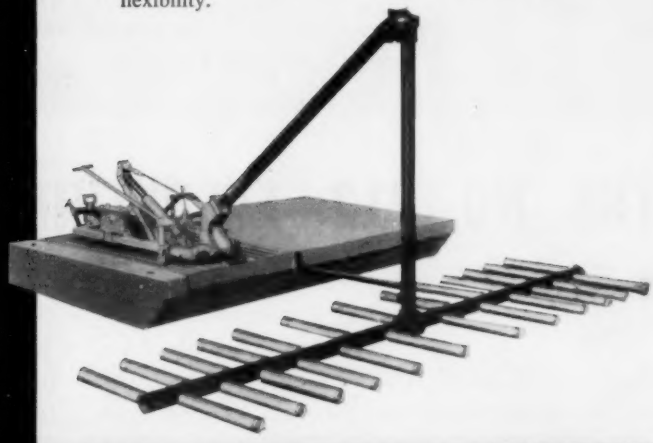
Provides wide-band aeration mass of finely divided bubbles. Individual units are easily raised for accessibility without tank de-watering and interruption of operation. Spacing of tubes may be varied for tapered aeration providing maximum flexibility.



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THE NO. 212—EVERYTHING ONE CITY NEEDS

The City of Glendale, Arizona, is proud of its streets and the way they're kept up. There's all the usual work for a motor grader—sidewalks, streets, curbs, cutting and cleaning gutters, leveling land, blacktopping. And the city does it all with just one machine—a CAT* No. 212 Motor Grader.

In one 8-hour day the No. 212 shown above has mixed and spread up to 350 tons of asphalt. The operator says: "I like the way it handles in narrow streets and on small jobs where you have to get around. It's got plenty of power for bigger jobs, too."

The way to choose a motor grader is by the *work it will do*. You don't buy it to brag about its size or what it cost. The No. 212 is the smallest and lowest-priced grader in the Caterpillar line. But it has proved that by taking a little more time it can do just about anything larger motor graders can.

Its 50 HP Caterpillar Engine is tough, simple, dependable, and it burns low-cost fuels such as No. 2 furnace oil without fouling. The whole machine is ruggedly built to stand up to steady work. It's easy to operate, with positive-acting power controls. No need to stand up to see the wheels, the blade and the job you're doing. And there's a full range of blade positions that can be changed from ditching to bank-sloping in less than a minute without leaving the seat.

Low first cost, low operating costs and high trade-in value make the No. 212 the right machine for many communities. Ask your Caterpillar Dealer for a demonstration on your own job. You can count on his reliable parts and service to protect your taxpayers' investment.

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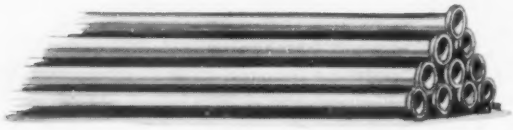
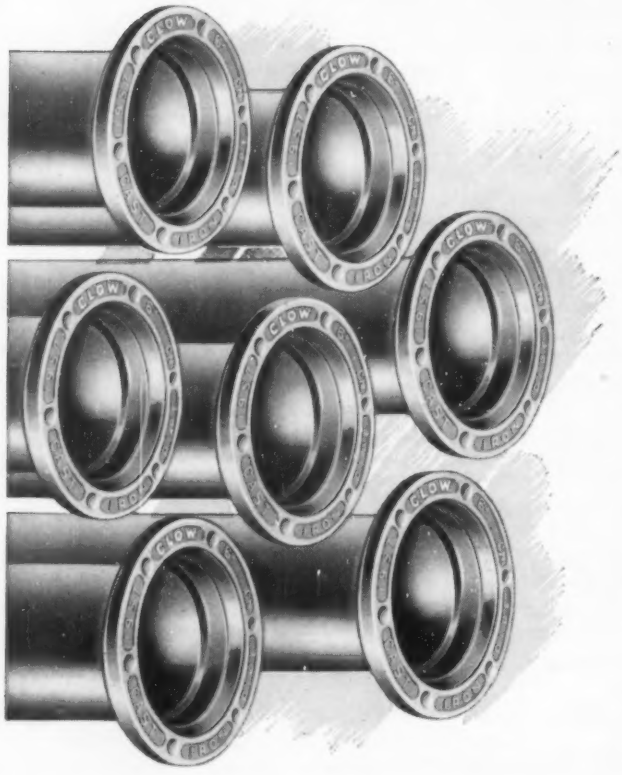
THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

take advantage of the plus factors when you specify UNDERGROUND WATER PIPE





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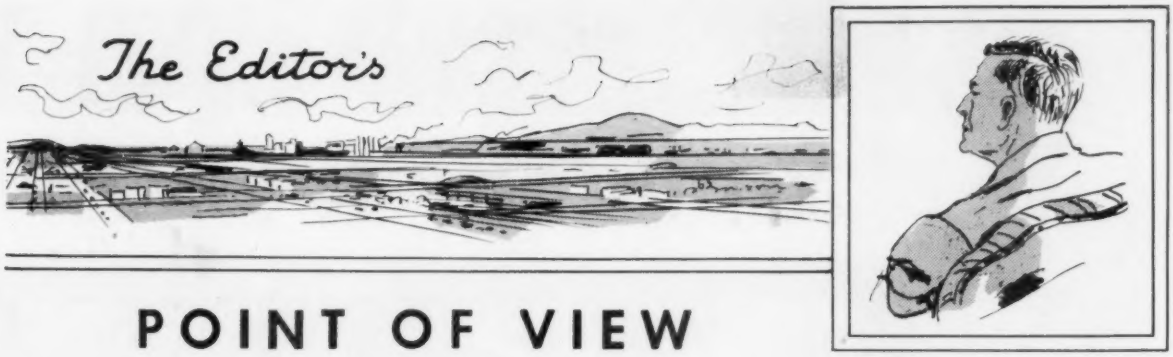


POINT OF VIEW

Safety Planning is Needed for Pedestrians in Big Parking Lots

SOME OF THESE new supermarkets provide parking lots for ten to eleven thousand cars. That means something like sixty acres of parking area, maybe more. It also means that there are going to be a lot of cars buzzing up and down through the passageways. On dark winter evenings there will be a special hazard to pedestrians, over and above the hazards that always exist for pedestrians today. Consideration must be given to providing safe passage for them to and from the individual parking spaces. Lighting, of course, is high on the list of essentials in safety; and first-class lighting, too; but this must be supplemented by protected walkways, by good signing and marking, and maybe by overhead or underground passageways.

There are Opportunities Unlimited in Sanitary Engineering

THAT IDEA developed by Civil Defense for supplying water to disaster areas by using milk containers is a fine one, and CD folks are to be congratulated. It bears out our belief that not all the good ideas have been thought of. There are still plenty waiting to be turned to use.

This, we feel, is especially true of sanitary engineering. We do not hold with those who think that the old fields of water, sewerage, refuse, et al, have been worked out. Maybe the trouble has been that minds and eyes have been looking at grass in another field.

Some time ago we collected data on peak daily and hourly water demands and on trends showing increases in per capita water consumption. Remarkably few states had any information on this; some had apparently not considered it; yet high demands as well as inadequate supplies are threats to water quality.

A few years ago one of our midwest states surveyed the city-county refuse situation. As a result of that survey and of quiet but intelligent follow-up, refuse collection and disposal have improved immeasurably. We think the same sort of a program in other states would produce equally fine results. And with the growth of subdivisions, the refuse problem is increasing.

The same program could be applied to sewage treatment plant construction; and there are few states that do not need improvement in this field.

Opportunities without limit exist for the sanitary engineer. Imagination, good planning, organization and industry—the old combination for success—apply here as in many other fields.

Municipal and County Water Supply and Sewerage Systems

IN HIS ANNUAL report for 1956, W. H. Weir, Director of Water Pollution Control for Georgia, says: "The rapid movement of population to cities and towns is continuing and many water and sewerage systems previously considered adequate for many years are now overloaded. Future planning must be more expansive. . . . A distinctive feature of recent suburban growth is the development of water and sewerage systems under county ownership. This activity for county governments must be expanded by means of independent systems or combined with adjacent municipal facilities."

The two matters touched on in this quotation are important ones. Water use is increasing and water supply and distribution facilities must be planned in advance and constructed in time to provide for the increasing needs. In regard to county facilities, we have often pointed out that this is a large field of opportunity because it is based on a present and serious need—a need that will continue to grow. It is time to discard the old idea that only cities, and their engineers and water works superintendents, have sewerage and water problems.

Deadline Approaching for Sanitary Engineering Certification without Examination

THE CERTIFICATION of sanitary engineers by the American Sanitary Engineering Intersociety Board is progressing, with more than 250 applications received. There are some indications, however, that many who are eligible for certification may not be aware of the opportunity—in particular those who may qualify for the Founders classification. Those in this category must file application by July 1, 1957, or lose their examination exemption privileges. The matter should be stressed in society and other engineering meetings, including those of a local level, wherever sanitary engineers are present.

You can stake your

River crossing of cast iron pipe line to carry sewage to disposal plant at Portland, Oregon.

Whether you select a man or a product, you judge dependability on the record.

Cast iron pipe's record is unmatched. Proof? Today nearly seventy cities are still using cast iron mains that have been in continuous use for a hundred years and more!

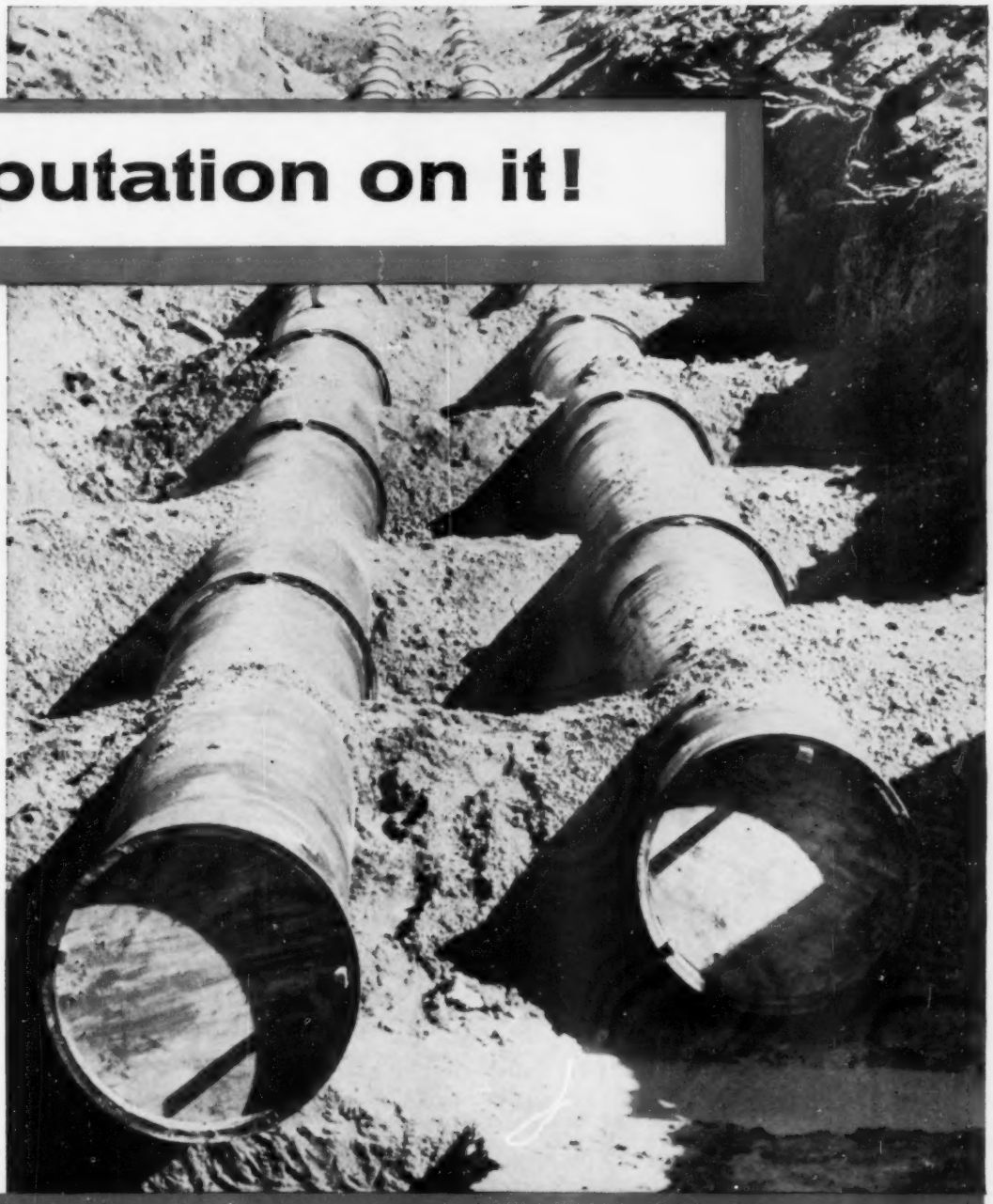
More important, the *modernized* cast iron pipe now being produced is even tougher, stronger . . . more reliable and efficient.

Specify cast iron pipe and you assure the long life, dependability and economy that protect *your* reputation.

Cast iron pipe for large automobile assembly plant in New Jersey.

CAST IRON PIPE

reputation on it!



Installing large diameter cast iron pipe lines supplying water to synthetic fibre plant in South Carolina.

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For further information write: Cast Iron Pipe Research Association,
Thos. F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3.

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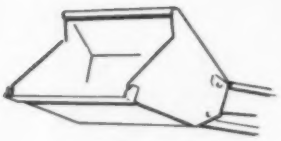
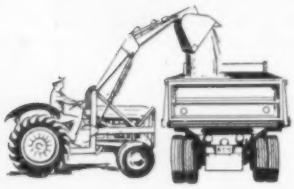


More Capacity Per Dollar

Ford Tractor-Loader gives you ½-ton load capacity at full lift . . . more than a ton breakaway capacity. Choice of buckets for many jobs.

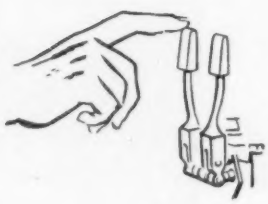


Greater Reach and Lift

Ford Industrial Loader provides 10′ 10″ lift from ground to bucket bottom . . . 26″ reach at full lift. Load entire truck from one side.

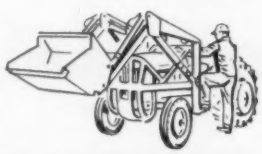
Instant Hydraulic Control

Easy-to-operate levers provide full, instant control of loader and bucket. Tractor hydraulic system is free for use with rear-mounted tools.



Easy, Step-On Design

Ford Loader leaves side of tractor open. Wide, low step-plate enables operator to move quickly, safely and easily into seat, with no climbing.



Find out how a Ford Tractor-Loader can handle your jobs for less. See your Ford Tractor and Equipment dealer, or write to: Tractor and Implement Division, Ford Motor Company, Birmingham, Mich.

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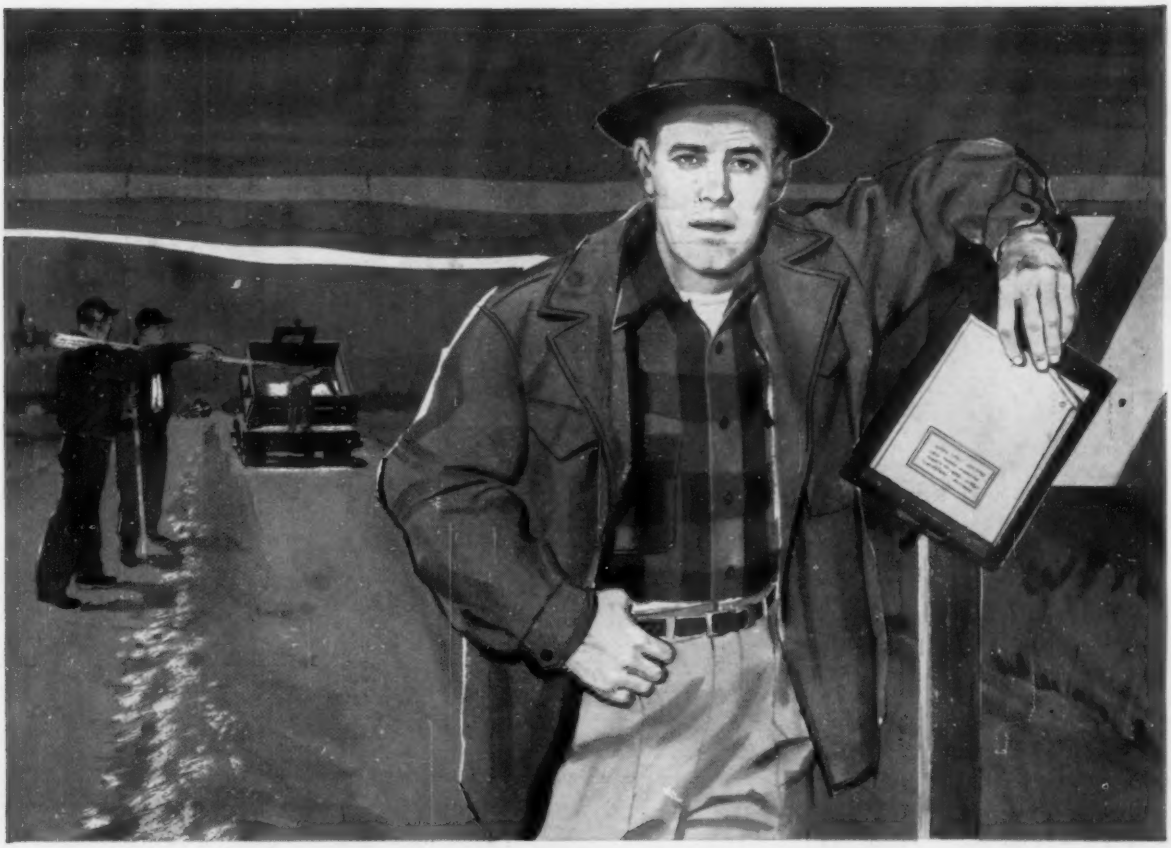

Salt stabilization builds better roads

Stabilizing with *Morton* Salt means added road life and reduced maintenance costs.

Stabilizing a road with Morton Salt is often the difference between a good road that will stand up under heavy traffic and a road that will require excessive maintenance within a year.

Secondary roads. Regardless of the materials used, roads stabilized with Morton Salt give more service per dollar than roads built by any other method—and the savings in aggregate alone more than pay for the salt. You get smooth, durable, water-repellent surfaces that require minimum maintenance.

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Shoulders. Stabilizing shoulders with Morton Salt not only checks erosion and rutting, it reduces dust and eliminates accidents caused by soft shoulders . . . also saves on grass and weed removal.

☐ ***Please send me your free booklet on salt stabilized roads.***

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(Please print)

Title_____

Address_____

City_____ County_____ State_____

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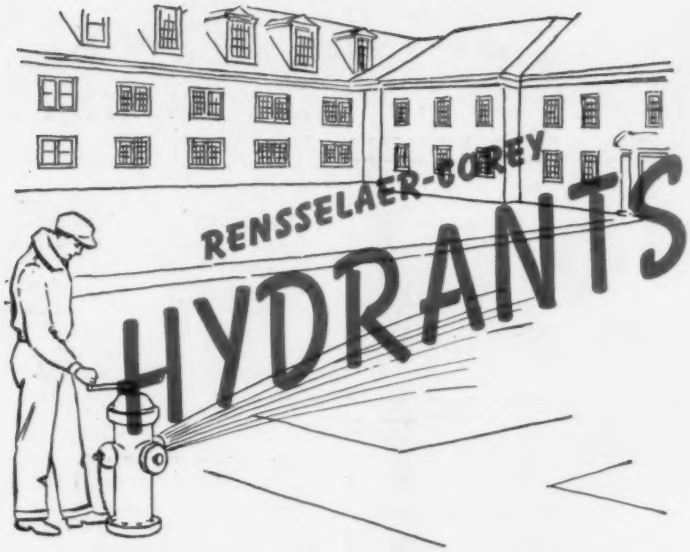
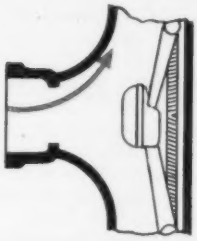


This is the hydrant that has been the standard of excellence in hundreds of cities for many years. Inspectors, maintenance men and fire chiefs, all have their reasons for endorsing the Rensselaer Corey Hydrant.

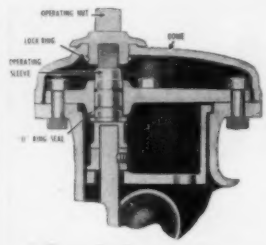
The illustrations show the clear-flow design which insures low head loss and maximum flow. Maintenance men like the simplicity of design and the speed of removing, inspecting and replacing the working parts as a single unit.

This hydrant opens with the pressure, is easy to operate and cannot stick. No digging for repairs, or for standpipe breakage. Now available with any type connection and "O" Ring seal.

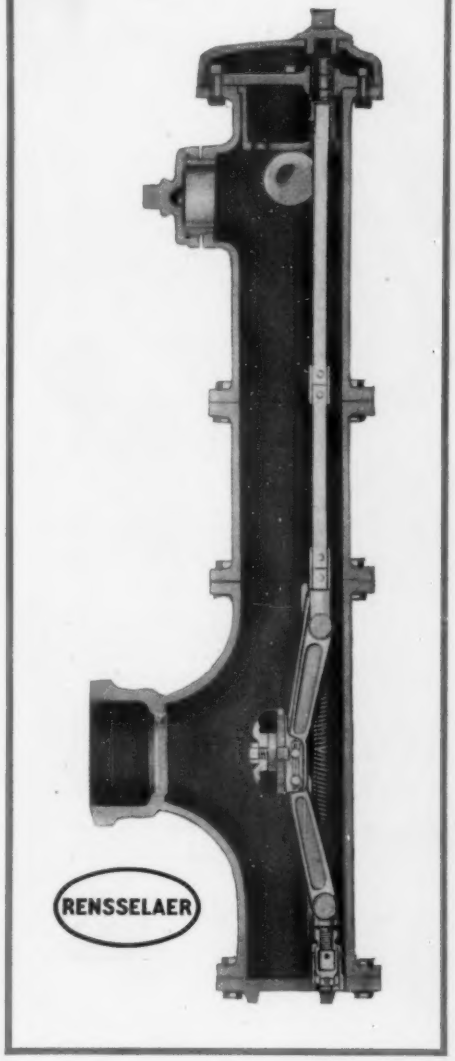
18



CLEAR FLOW
LOW HEAD LOSS



HYDRANT HEAD
WITH "O" RING SEAL



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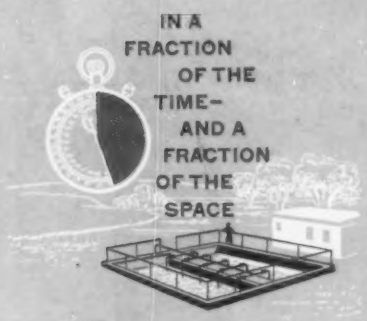

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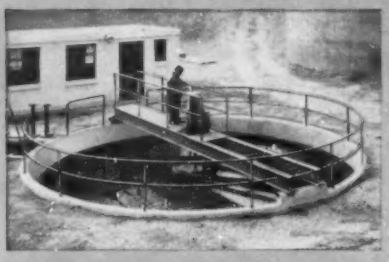

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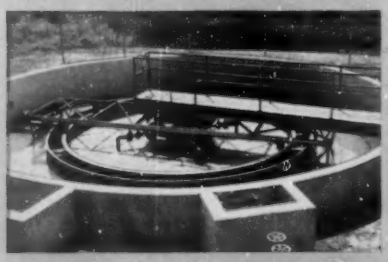
system units twice as fast—save half the space

Improved activated sludge plant treats sewage in about 5 hrs. as compared to 10-12 hrs. for traditional equipment. Very compact, economical to install. **Bulletin 6550**

CLARIFIERS

for high rate treatment provide optimum efficiency —save time and space

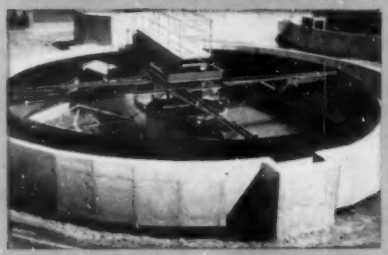
Remove suspended solids and surface scum from liquids. Velocity control, advanced scraper blade design, efficient drive, automatic skimmer. Full range of models. **Bulletin 800/6000**



CYCLATOR®

clarifier, Type AR, for many waste applications

Treats domestic sewage by biological oxidation. Combines pre-aeration, mixing, sedimentation and discharge in one operation. Basin has central compartment containing COLAFLEX® diffusers in which sewage is mixed, aerated and coagulated. **Bulletin 850**



SEDIFLOTOR®

clarifiers provide both sedimentation and flotation in one compact unit

Where space is limited and high-rate production a must this unit is ideal for removing both floatable materials and settleable solids. **Bulletin 6051**

INFILCO
INCORPORATED
General Offices • Tucson, Arizona • P.O. Box 5033
Field offices throughout the United States and in foreign countries

INFILCO

37422-PW

These are only a few of the products for sewage and waste treatment in the complete INFILCO line. It includes plants and equipment to meet your every need. Improved processes utilizing INFILCO equipment permit extremely fast, efficient and economical operation.

The INFILCO line will give you the results you want in far less time and at lower overall cost than any ordinary equipment. Write today for bulletins of interest to you. Inquiries are invited on all problems in the treatment of waters, sewage and wastes for municipalities, institutions, general industry.

See your Consulting Engineer. If you are planning installation of *any* major equipment, the services of a reliable Consulting Engineer can be invaluable. He will help you select the type of equipment that best meets your requirements and budget, and supervise its installation for maximum efficiency.

The **ONLY** company **IMPARTIALLY** offering equipment for **ALL** types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, aeration, ion exchange and biological treatment.

Rockwell Dual Unit Compound Meter Assemblies

EASIEST To Handle, Install, Service

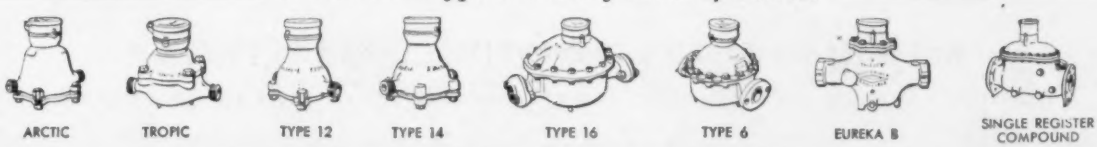
Big, bulky 8 in. compound meters are always a trial to install, even more of a problem to service. Now, with Rockwell—two meter single register compound manifolds you can save time and money. The complete assembly weighs approximately 100 lbs. less than a single big meter. Two men can handle it with ease. Maintenance of this Rockwell unit is a cinch. Either meter can be used to record off-peak loads while a new or repaired meter is being installed. And remember, Rockwell Dual Unit meter assemblies are razor sharp in the measurement department. They record *all the flows* with far greater accuracy than a single 8″ compound. And they cost less. Write for latest bulletin.

ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA. Atlanta Boston Charlotte Chicago Dallas Denver Houston Los Angeles Midland, Tex. New Orleans New York N. Kansas City Philadelphia Pittsburgh San Francisco Seattle Shreveport Tulsa In Canada: Rockwell Manufacturing Company of Canada, Ltd., Toronto, Ontario

ROCKWELL WATER METERS

A Size and Type For Every Kind of Service



the cleanest cities in America have Wayne swept streets

WAYNE
POWER SWEEPERS

Model 450 . . . most proved sweeper in America

so maneuverable it practically sweeps under parked cars!

Sharp corners, curb returns, depressed storm drains, all those hard-to-get-at-places are easy for a Wayne. No other sweeper made is so maneuverable. The curb broom always is in the operator's sight . . . ahead of the front wheels where it sweeps broken glass, tin cans and damaging refuse away from the tires. The Wayne steers so easily the operator can cut in and out around parked cars, where others fail to clean. You can always tell a Wayne-swept city by the cleanliness of these hard-to-clean places. Write for descriptive literature.

RENT A WAYNE OUT OF OPERATING FUNDS

No capital investment required. About $300 a month will give you the benefits of a modern street sanitation program with a Wayne Sweeper. Labor savings alone will pay for this low rental cost. 60 cities in 22 states now have Wayne Sweepers under this innovationary rental plan. For further details, write for Bulletin 413.

WAYNE MANUFACTURING COMPANY 1220 E. Lexington Ave., Pomona, Calif.

WORLD'S LARGEST PRODUCER OF POWER SWEEPERS FOR CITIES AND INDUSTRY

HEAVIEST-DUTY, LARGEST GPM HYDRAULIC SYSTEMS AVAILABLE
EASILY OPERATED . . . FAST CYCLING . . .

HOPTO®

DIGGER • SHOVEL • CRANE

Put a man on a HOPTO and he's *twice* the money-maker! HOPTO's effortless 20-second cycles . . . HOPTO's *new*, more powerful triple tandem pump and split hydraulic system . . . and HOPTO's fast switch from backhoe to shovel give you *more* for your money . . . *more* for your time! Get the facts on HOPTO—new and better than ever!

Gives you MORE

WITH BACKHOE OR SHOVEL BUCKET

30 SECOND SET-UP! Independently controlled hydraulic outriggers level and stabilize unit . . . from operators seat . . . in thirty seconds!

HOPTO 360-57-90 takes a half-yard bite, is *the only unit with a 360° continuous swing*, and cycles fast with backhoe or shovel bucket. Mounts on truck or carrier.

HOPTO 185 SPR gives you an integral built digger-shovel-crane on rubber. Handles up to 30" bucket. Rolls to job-site at highway speeds.

HOPTO 190 SPC, the complete unit model that packs real work-capacity on tracks in a mobile, compact unit that gets in anywhere . . . even on marshy soil.

HOPTO 200 DTM-57-72 mounts on any 2-ton or larger truck, handles up to 30" backhoe or shovel.

HOPTO 80 CTM mounts on a crawler tractor, handles up to 30" bucket, cuts costs by using power you now have.

*SPECIFICATIONS

MODEL	SWING	REACH	DIGGING DEPTH	LOADING CLEARANCE BACKHOE	LOADING CLEARANCE SHOVEL BUCKET
360-57-90	360°	30'	20'-0"	15'-6"	16'-10"
200 DTM-57-72	200°	19'	13'-6"	11'-6"	9'-3"
190 SPC	190°	17'-2"	11'-3"	9'-3"	9'-7"
185 SPR	185°	17'-2"	11'-3"	9'-3"	9'-7"
80 CTM	180°	14'-6"	10'-0"	7'-1"	7'-5"

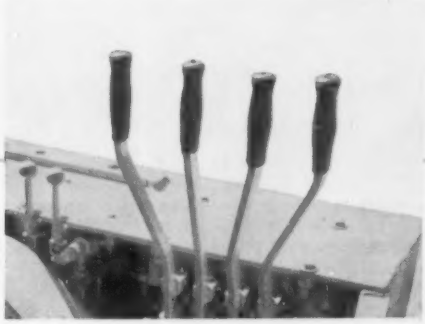
*180° BUCKET TILT ON ALL MODELS

One of the twelve HOPTO models is tailor-made for you. Write stating your needs and complete information on the unit to fit your requirements will be promptly forwarded.

BADGER MACHINE COMPANY
WINONA, MINNESOTA DEPT. P

NEW SIMPLE CONTROLS

An hour's practice and a handyman can safely handle a HOPTO! Four handy levers control boom and bucket; two separate levers give individual control of each outrigger for fast leveling and stabilizing from operator's seat . . . in half a minute!



Less downtime, lower service costs

One of 9 reasons why you'll find International Trucks cost least to own!

When they do need service, INTERNATIONAL cab-over-engine models get in and out of the shop in a hurry.

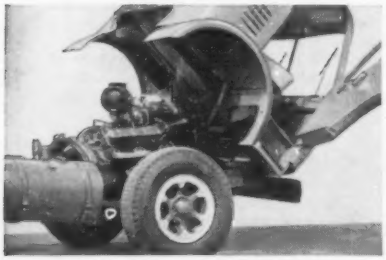
Tilting cab design with easy accessibility lets mechanics get right to work—and gives *you* the use of the trucks more hours each month, more days each year.

It's another example of INTERNATIONAL's policy: spend more to *build* a truck to keep operating costs at rock bottom. Actual fleet cost records prove* that over the years, INTERNATIONAL Trucks cost *least* to own.

Why not get in on some of these savings yourself!

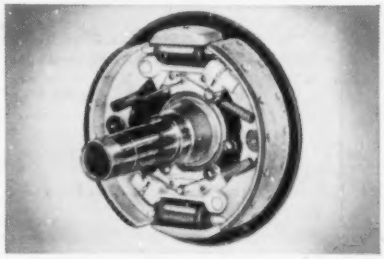
**Signed statements in our files, from fleet operators throughout the U.S., back up this statement.*

INTERNATIONAL HARVESTER COMPANY, CHICAGO
Motor Trucks • Crawler Tractors
Construction Equipment • McCormick®
Farm Equipment and Farmall® Tractors

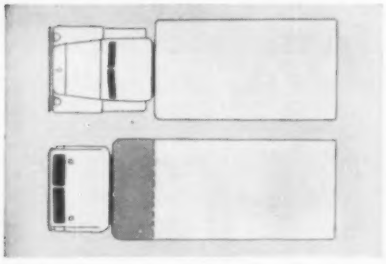


1 Quick, easy accessibility saves time and money. In a few seconds, one man can easily swing the counterbalanced COE cab way forward for complete access to engine and all accessories. Cab is automatically locked in the "down" position.

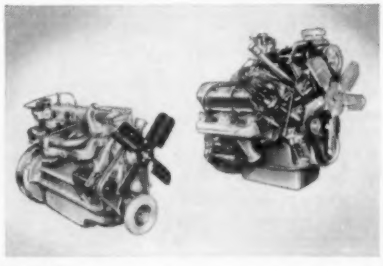
2 Exclusive clutch design with roller-mounted release fingers reduces pedal pressure by 25%, makes driving a lot easier. Engagement is smooth, too. Long-lasting linings and big area greatly increase clutch life and cut costs.



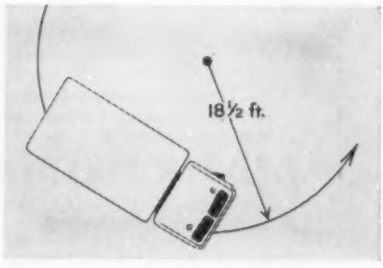
3 Brakes have one function—safe stops. Powered hydraulic brakes evenly distribute stopping pressure over entire lining area for swift, smooth, straight-line stops and longer life. Air brakes are standard on many models, available on most others.



4 Bigger payloads on shorter wheelbases with BC dimension of only 81 inches, plus ideal weight distribution. These COE models are easier to maneuver and require less parking space. Safer, too, with the best vision you can get.

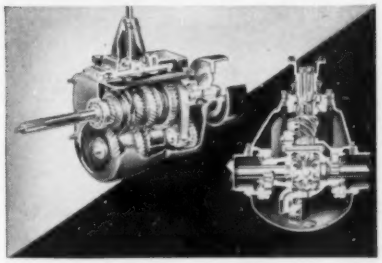


5 Fourteen engines power this class of COE models—famous sixes and new V-8's with up to 257 hp. Gasoline, LPG and diesel fuel. Every engine produces economical, usable horsepower at low rpm . . . stays on your job longer at *least* cost.

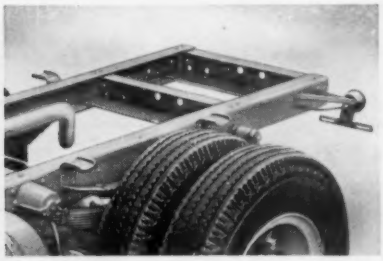


6 Turning radius as short as 18½ feet! True geometric steering for greater maneuverability and easier handling. Cam and roller-mounted twin lever type steering gears. Scientific steering wheel position for non-fatiguing driving.

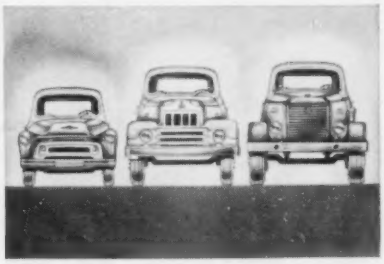
INTERNATIONAL cab-forward and cab-over-engine 4-wheel models in the 16,000 to 30,000 lbs. GVW class total 32. All carry bigger loads on the shorter wheelbases. All have better weight distribution and are easier to maneuver. Choice of 14 reliable engines that produce *economical, usable* horsepower at low rpm—gasoline, LPG and diesel—up to 257 hp. Complete selection of load-moving and load-carrying components to suit every hauling job *exactly*.



7 Choice of 14 transmissions and 24 rear axles assures you the proper capacity and final drive ratios to match the engine power, your load and road conditions *exactly*. You save fuel, get better all-round performance and longer truck life.



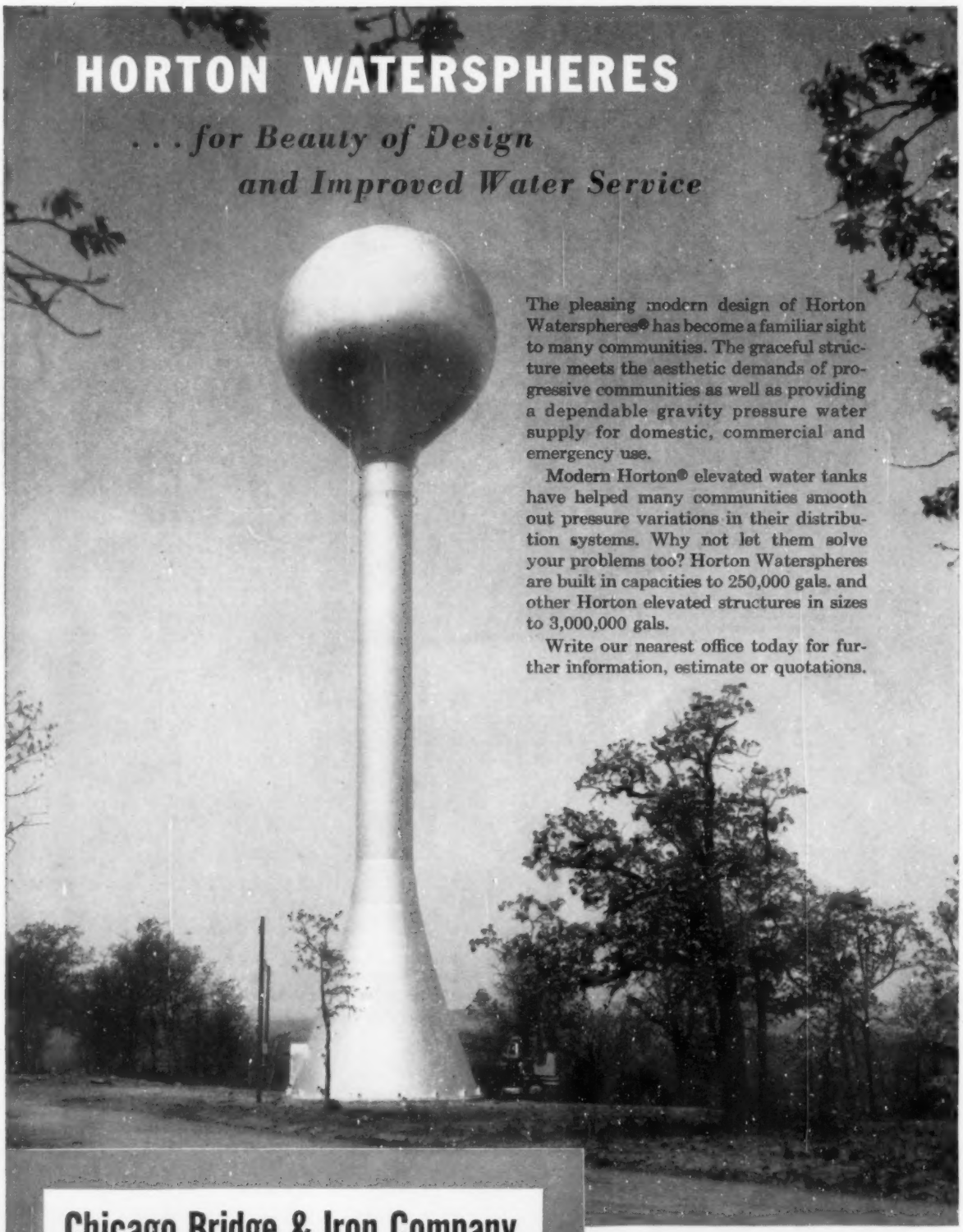
8 Steel-Flex frames combine great strength without excess weight. Non-crystallizing, cold squeezed rivets are used throughout for extra rigidity and proper flexibility. Inverted L-type reinforcements provide full load-length support.



9 World's most complete line. There is an INTERNATIONAL "tailor-made" for every truck job, ½ tonners to 90,000 pounders. Choice of 4-wheel, 6-wheel and all-wheel-drive models, conventional and COE design. Every one built to cost *least* to own.

HORTON WATERSPHERES

. . . for Beauty of Design and Improved Water Service



The pleasing modern design of Horton Waterspheres® has become a familiar sight to many communities. The graceful structure meets the aesthetic demands of progressive communities as well as providing a dependable gravity pressure water supply for domestic, commercial and emergency use.

Modern Horton® elevated water tanks have helped many communities smooth out pressure variations in their distribution systems. Why not let them solve your problems too? Horton Waterspheres are built in capacities to 250,000 gals. and other Horton elevated structures in sizes to 3,000,000 gals.

Write our nearest office today for further information, estimate or quotations.

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
New York • Philadelphia • Pittsburgh • Salt Lake City • San Francisco
Seattle • South Pasadena • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

CBI

125,000-gallon Horton Watersphere, 92 ft. to the bottom, erected for Tulsa, Oklahoma.

All-round earth-moving team for cities, towns and counties

VERSATILITY

The Allis-Chalmers HD-6 crawler and 44 scraper combination has the versatility to handle a wide range of jobs—grading, filling, stripping, stockpiling, dozing and gravel pit work.

LOW COST

Check and you'll find first cost is within budget limits. And advanced-design features like 1,000-hour lube intervals for crawler truck wheels, idlers and support rollers helps keep down operating costs. This team is large enough to get jobs done fast, small enough to work economically on low-yardage operations.

HIGH PRODUCTION

Built to give your community years of service. Full-scale earth-moving ability of the 4.7-cu-yd model 44 scraper features wide cutting edge, high-flotation tires and ample clearance, high apron lift, and forced ejection. Full hydraulic control speeds jobs, simplifies operator's work.

For more facts about the versatile HD-6 crawler and its complete line of tractor equipment, see your Allis-Chalmers construction machinery dealer. He will show you its outstanding performance on a variety of jobs.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION,
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

DIXON gave this tank over 11 years protection

By Using Dixon Flake Silica Graphite Primer and Finish Paints...

Painted properly with Dixon Paints, this 1.5 million gallon water tank in the city of Yonkers, N. Y., was still getting good protection over 11 years later.

This is just one of many such case histories showing that Dixon paints, properly applied, double normal paint life.

Unusual? Not at all when you look at actual Dixon customer records running back for 60 years. Nor when you get the full story on the properties of Dixon paints.

Dixon special interior water tank paints are non-toxic, and will not impart an odor, taste, or color to the water. Like the exterior tank paints in the Dixon line, they have flake silica graphite pigments for maximum resistance to atmospheric attack and moisture penetration. Unusual film flexibility allows for expansion and contraction of the water tank without causing the paint to crack or flake.

Ask today for Dixon literature and sample contract forms and specifications showing how to get similar savings in painting your water tanks.

4613

DIXON

JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY 3, N. J.

Paint Products Division • Dept. PW-3

Please send me complete information on water tower painting.

Name _____ Title _____

Company _____

Street and Number _____

City _____ Zone _____ State _____

LEADER IN PUBLIC WORKS

★

Gerard A. Rohlich is Professor of Civil Engineering at the University of Wisconsin. Born in Brooklyn, N. Y., he is a graduate of Cooper Union with a BS in Civil Engineering; and he also holds BS, MS and PhD degrees from Wisconsin. His graduate work was in the specialized fields of hydraulic and sanitary engineering, with minor work in bacteriology and chemistry. He has taught at Carnegie Institute and at Pennsylvania State. During World War II he served as sanitary engineer in the Office of the Chief of Engineers.

Listed in "Who's Who in Engineering" and in "American Men of Science," he is the author of many publications in the field of sanitary engineering. He is a registered professional engineer and has served as consultant on municipal and industrial waste treatment problems; he is a reserve officer of the Public Health Service. He has contributed widely of his time and talents, being a member of the Research Committee of the FSIWA, a member of the subcommittee of Waste Disposal of the Dairy Industry Committee and of the Sanitary Engineering and Occupational Health Section of the National Institutes of Health Division of Research Grants. He was the 1955 recipient with two coworkers of the Harrison P. Eddy medal from the Federation of Sewage and Industrial Waste Associations for outstanding research.

He is married and he and Mrs. Rohlich have a fine family of seven children, four boys and three girls.

Planning better roads

by **INTERNATIONAL SALT COMPANY, INC.**—America's largest producer of salt

Stabilization of Gravel Now Required on New York's "Erwin-Program" Roads

The "Erwin Program"—New York's law to provide state aid for the improvement, repair and reconstruction of certain town highways—was recently amended in a most significant way. This law now reads that gravel or other surfacing "*shall* be stabilized with a suitable binding material..." Formerly, the law simply stated that such surfacing "may be stabilized."

With this amendment to the "Erwin Program" in effect, it is now the job of Town Highway Superintendents and other officials to select the most effective gravel stabilizer for their roads. At the same time, they must also select a stabilizer which is low in cost, readily available, and easy to store and apply.

In a great majority of cases, the gravel stabilizer which meets all these requirements best is rock salt. And, in fact, rock salt has already been widely used

Genesee County road stabilized with low-cost Sterling Rock Salt. Gravel surface is hard, long-wearing, virtually dustless even in driest weather. Due to Sterling Rock Salt's antifreeze action, this road has unusual resistance to frost penetration.

on many New York State "Erwin-Program" roads—as well as others throughout the state.

One excellent example of rock-salt-stabilization under the "Erwin Program" comes from Genesee County, New York. This county's experience is typical of many where rock salt has helped to provide better roads—at lower costs. According to Genesee County Highway Superintendent Robert T. Carrier, the use of rock salt as a stabilizing agent has proved unusually successful on his roads. "The gravels in our area," he writes, "are particularly well suited to the use of rock salt, since there is a well-proportioned blend of hard material and clay binder."

Commenting further on rock salt as a stabilizer, Carrier says: "Recent research has shown us that 12 tons of rock salt per mile of road surface gives a satisfactory and long-lasting job. The maintenance of such stabilized sections of road has decreased—leaving more time and money for new construction and reconstruction. Where all-weather surfaces have been placed on these stabilized bases, they have remained sound, and maintenance has been at a minimum.

"Rock salt on our 'Erwin-Program' roads has also increased the density of their bases, eliminating the penetration of water. This, in turn, has reduced the freeze-thaw cycle common to our climate and subsequent frost action. Rock salt provides a good base material for future all-weather wearing surfaces. And, in short, it's helping us to save what we have, and allowing us more time and money to catch up with the ever-increasing demands of traffic."

In New York—and many other states—the product most often chosen for

Sterling Rock Salt was also used on this Genesee County road. It was applied, mixing the top 3 to 4 inches. Other operations: mechanical mixing, blending, wetting, rolling, final blading and rolling.

road stabilization is Sterling Rock Salt, produced by International. This rock salt has all the advantages that city, state and county highway officials demand: it provides positive, long-lasting stabilizing action; it's low in cost; it's easy to store and apply—and it's always readily available when and where you need it.

Sterling Rock Salt, of course, is effective as a stabilizer for road shoulders and bases—as well as the wearing surface. With road bases this product is particularly important because *a road is only as good as its base.*

FREE TECHNICAL ASSISTANCE ON ROAD STABILIZATION

Rock-salt-stabilization procedures vary with particular soil and road conditions. For expert advice on how stabilization can work in *your* area, contact International. An International "Salt Specialist" will be glad to help you work out an effective, money-saving rock-salt-stabilization program for your system. He'll show you facts and figures on actual road-stabilization jobs now under way. And he'll work with you in lining up such details as application procedures, specs, etc. No cost or obligation. Just contact your nearest International sales office.

SPECIAL OFFER. For detailed technical information on rock-salt stabilization write for International's free series of booklets, "Better Highways." Address: International Salt Company, Inc., Scranton 2, Penna.

Sales offices: Atlanta, Ga.; Chicago, Ill.; New Orleans, La.; Baltimore, Md.; Boston, Mass.; Detroit, Mich.; St. Louis, Mo.; Newark, N. J.; Buffalo, N. Y.; New York, N. Y.; Cincinnati, O.; Cleveland, O.; Philadelphia, Pa.; Pittsburgh, Pa.; and Richmond, Va.

FOR ROADS, INDUSTRY, FARM, AND HOME—

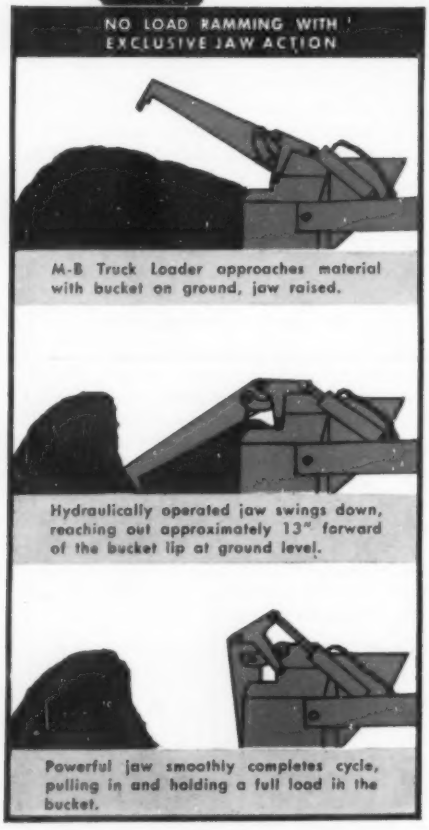
STERLING SALT

PRODUCT OF INTERNATIONAL SALT CO., INC.

NEW! Different!

Beats All Other Methods of Material Handling on Most Jobs

the JAW makes the difference



M-B Truck Loader approaches material with bucket on ground, jaw raised.

Hydraulically operated jaw swings down, reaching out approximately 13" forward of the bucket lip at ground level.

Powerful jaw smoothly completes cycle, pulling in and holding a full load in the bucket.

No Other Loader Like It!

Patented, Powerful Hydraulically Operated Jaw makes bucket independently self-loading — eliminates "charge" loading shock and strain on truck. Heavy duty ½-yd. bucket easily handles all types of material. Larger bucket available for snow loading and special jobs.

Complete Hydraulic Control throughout the entire cycle is provided by heavy duty side boom rams. You get even load distribution in the truck body, since the bucket can be dumped at any point.

Strong Baseframe mounts on top of truck chassis, under dump body frame, evenly distributing all lifting and loading forces.

High Tensile Steel Boom Arms provide high strength with amazingly low weight for greater payload.

Fits All Trucks — including 4-wheel drive units, cab-over, tilt cab and conventional trucks without violating legal width restrictions.

Full Safety Features protect men and equipment. Positive safety system on cab doors and dump body thoroughly protect against interference with loader. Side booms cannot drop suddenly if power should fail.

TRUCK LOADER

Fast, Self-Loading Hydraulic Bucket Eliminates Ramming of Material

Here's real cost-cutting efficiency for dozens of municipal, county and highway jobs . . . anywhere material must be loaded and hauled in a hurry! One man with an M-B Truck Loader eliminates much of the hand labor, extra personnel and truck waiting time generally necessary with other loading equipment. No longer do your men have to "chase" material to be loaded along the street . . . the jaw reaches out and fills the bucket quickly and completely, even when picking up small piles.

Thoroughly job-proved over the past several years, the M-B Truck Loader has won enthusiastic acceptance by major municipalities.* Find out how *you* can speed-up your material handling at reduced cost . . . write today for complete information on the new M-B Truck Loader!

M-B CORPORATION
1611 Wisconsin Avenue
NEW HOLSTEIN, WIS.

*Names of cities and signed testimonials will gladly be sent free, without obligation.

Really Cuts Costs On Jobs Like These!

Windrow Pick-Up. . . Easily handled by the Truck Loader without additional equipment or men.

Street Repair Spoil Removal . . . Both big and small piles of dirt, broken concrete, macadam, etc. are quickly loaded and hauled away by one unit.

Solo Sander-Truck Operations . . . M-B Truck Loader loads sand from stockpile, hauls to dispersion point and spreads sand where needed.

Dispersed Pile Clean-Up . . . Fast, mobile Truck Loader quickly moves from one pile to the next . . . loading in seconds, handling the entire job as one complete unit.

Scattered Jobs . . . Best load and haul rig available for a multitude of small scattered jobs which would ordinarily tie-up a high production loader and dump truck.

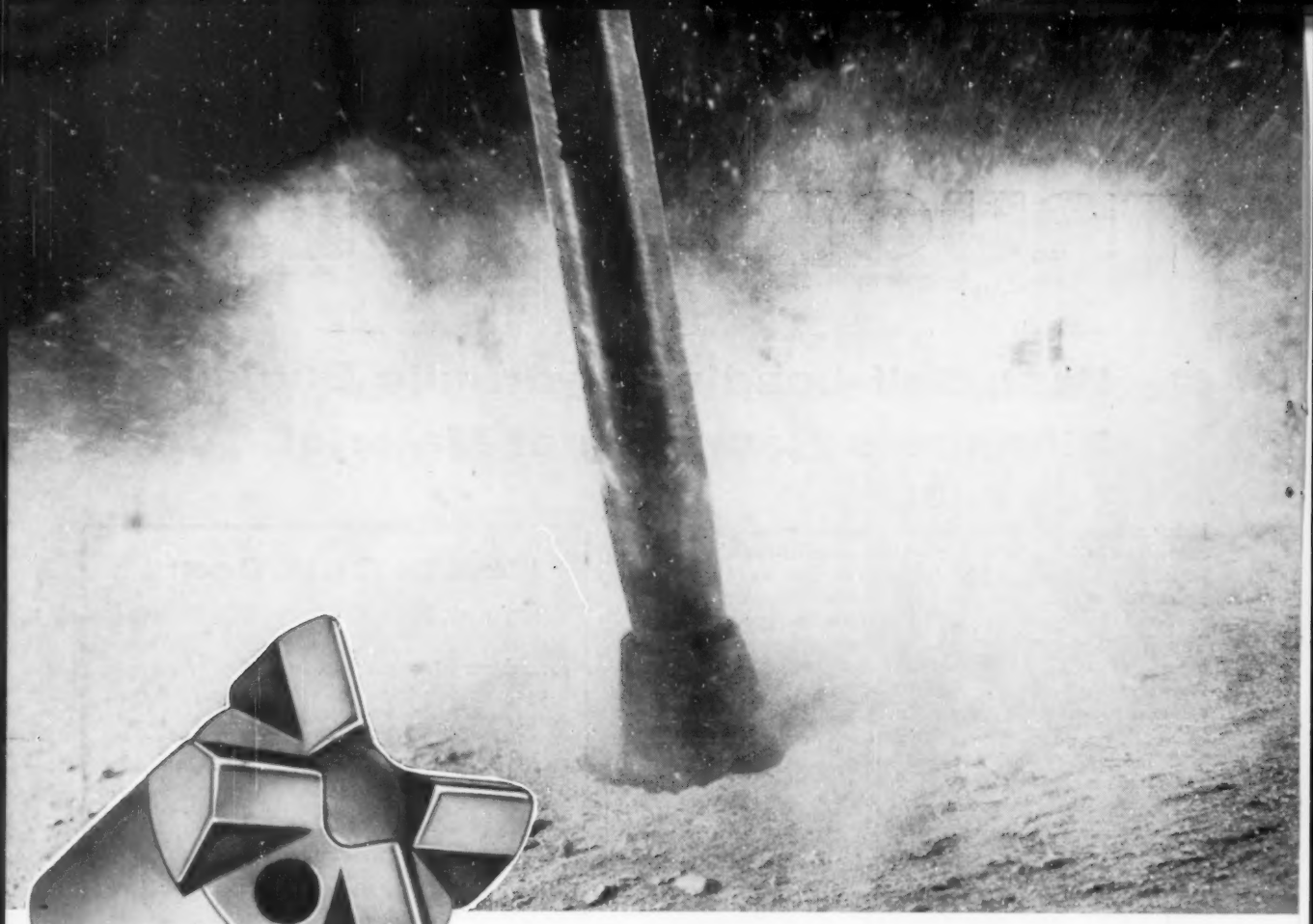
Sweeper Pile Pick-Up . . . Ideal for hard-to-load leaves and similar street sweepings. Exclusive jaw can pick up the smallest piles without hand labor.

Snow Loading . . . Quickly loads and hauls snow from scattered pick-up points. Special snow-loading bucket available.

MANUFACTURERS OF QUALITY MUNICIPAL AND CONSTRUCTION EQUIPMENT SINCE 1907

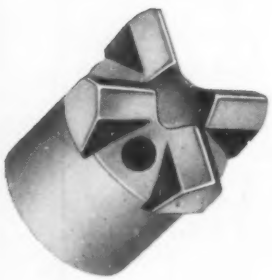
MB CORPORATION
NEW HOLSTEIN WIS

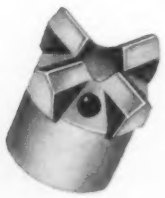
PACKER BODIES LINE MARKERS SWEEPERS TRUCK LOADERS



Take a close look...

Le Roi CRD one-use bits save you money 4 ways





1. You drill faster with low-cost Le Roi CRD one-use bits because they have a special offset gauge feature which permits the use of thinner wings, and a steeper reaming angle. Greatly reduced binding, ample clearance for cuttings.

2. You have less drill-steel breakage with Le Roi CRD one-use bits. The method of bit attachment eliminates threads on the drill rod. And since a drill rod is only as strong as the root diameter of its threads, the tapered, *threadless* CRD's give you a stronger, power-saving union, and longer drill-steel life. Other savings result because you also reduce drill-steel handling, and reconditioning costs.

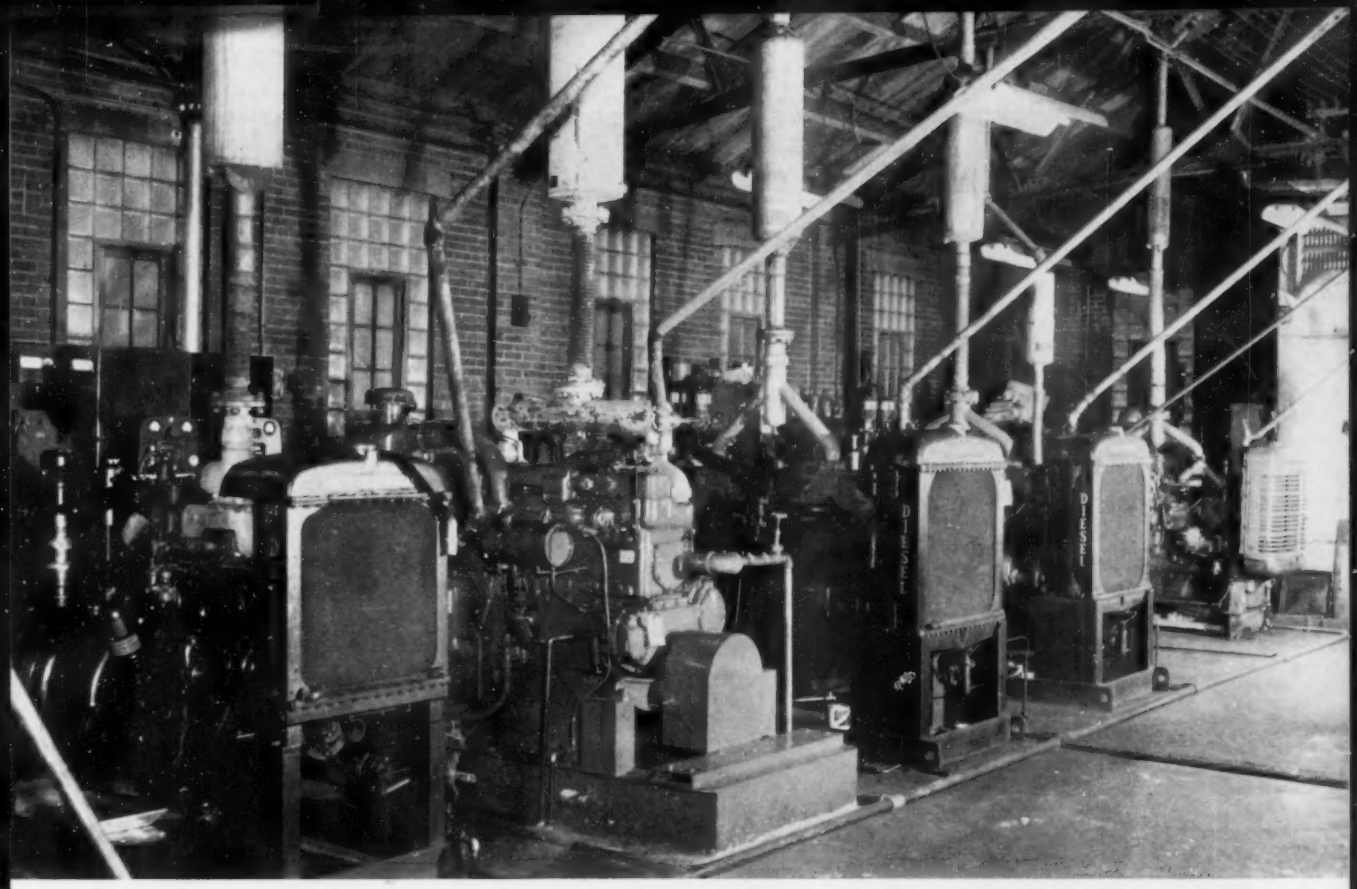
3. You have less wear and tear, too. Rifle bars, rifle nuts, and chucks will last longer because Le Roi CRD's are designed to reduce binding and ease strain on rotation parts of your drills.

4. They cost less, initially. CRD's cost less than 25¢, half as much as comparable multiple-use bits. There's a big saving in time and labor spent handling bits, too. CRD's knock-off, throwaway use eliminates unscrewing, and cuts out all of the time-consuming traffic between operator and bit-sharpening shop.

It costs practically nothing to try them. You don't need to invest in special threading or reconditioning equipment when you use Le Roi CRD one-use bits. Satisfy yourself that they can save you money. Get a can today, and start cutting your drilling costs right away.

AT-77

LE ROI Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.



Here are five of eight International diesels that have driven Ready-Power generators in Standard Carbon's powerhouse for a total of 107 engine service-years. The UD-1091, second from left, is seven months old. The other 7 power units average over 15 years each of dependable service.

8 Ready-Power International driven GENERATORS CUT ELECTRIC COSTS 43%

Standard Carbon's International power units going strong after 107 service-years

The Standard Carbon Co., Steubenville, Ohio, is a nationally famous manufacturer of carbon brushes.

President W. F. Rogers fills in these details of their powerhouse operation: "We started in business in 1928 operating on purchased power. Back in 1939 we set up our own powerhouse—starting with an International PD-80 diesel power unit on a 48KW Ready-Power generator. Shortly thereafter we bought two more of these units. Today our eight Ready-Power generators are all driven by Internationals—*and we are generating power for 43% less than we pay for the 15% of the electricity we still purchase.*"

Supt. George Rogers adds: "Good service with only minor repairs sums up our experience with Internationals. Our Internationals have totalled 107 service-years—an average of over 13 years per engine. And only recently I rebuilt one of the 17-year-olds for the first time and still was able to reuse many of the original parts including the crankshaft!"

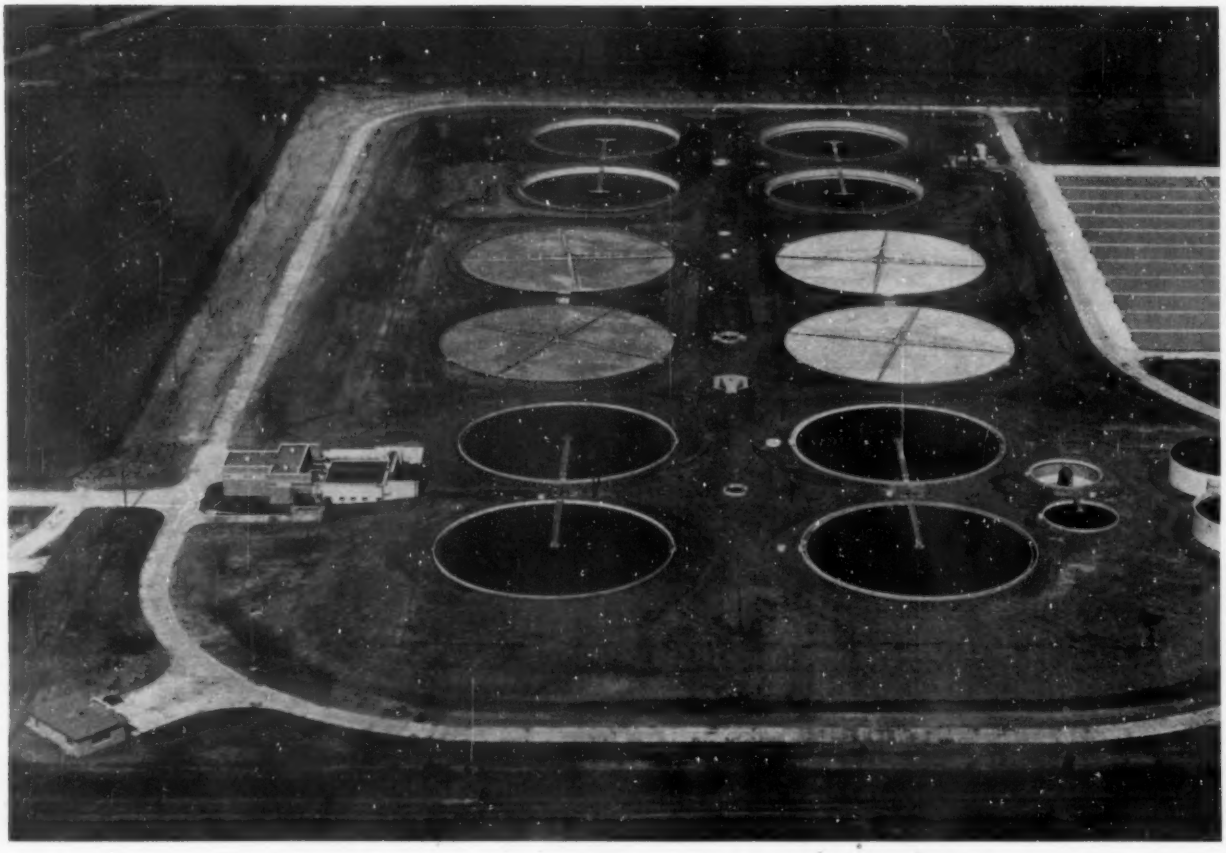
You, too, can get this same kind of completely dependable, low-cost power for your generator sets...or any driven machine in your pit or quarry. Simply call your easy-to-locate International Power Unit Distributor or Dealer. He can make power recommendations that are right for your needs. Equally important, his service facilities, his parts stock, his desire to be of service will help you get the most out of your engines. Call him soon.

INTERNATIONAL®

International Harvester Company
180 N. Michigan Ave., Chicago 1, Illinois

CONSTRUCTION EQUIPMENT

A COMPLETE POWER PACKAGE INCLUDING: Crawler, Wheel, and Pipe-Boom Tractors . . . Self-Propelled Scrapers and Bottom-Dumps . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Trucks . . . Diesel and Carbureted Engines . . . Motor Trucks



Beaumont Selected Trickling

The Southwest's biggest biofiltration plant in fast-growing Beaumont has joined the impressive list of modern, efficient sewage treatment works that utilize vitrified clay underdrain blocks of standard TFFI specifications in their trickling filters.

This plant is designed to handle with ease a population load in excess of 200,000. Utilization of up-to-date trickling filters result, in the Beaumont plant, in a remarkably low first cost and an anticipated very low operating cost.

Other important reasons for choosing trickling filters with TFFI blocks in *any* plant are: Simple, easy operation; long life—longer than the bonds issued to pay for plant; overload is no problem—take temporary and shock loads in stride. Also, good results: top-notch effluent, day in and day out; ease of expansion, trickling filters, properly designed, are easy to expand to meet future increases in population or loading. And adaptability to handle industrial wastes and domestic sewage, separately or combined.

TRICKLING FILTER

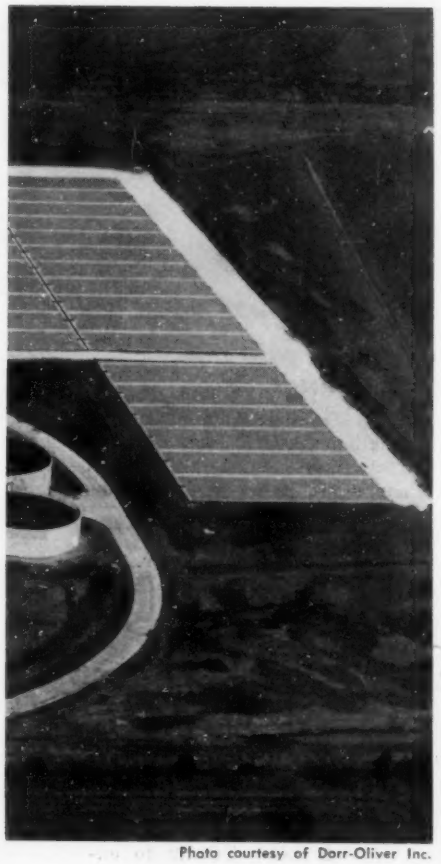


Photo courtesy of Dorr-Oliver Inc.

30 MGD series parallel type biofiltration plant at Beaumont, Texas.

Consulting Engineers:

George J. Schaumburg, Consulting Engineers, Beaumont, Texas

Forrest and Cotton, Engineering Consultants, Dallas, Texas

Contractor:

Tellepsen Construction Company, Houston, Texas

Equipment includes:

Four 195-foot diameter Dorrco distributors
Dorrco sludge pumps

Two 50-foot diameter Densludge thickeners

Chain Belt Co. bar screens

TFFI

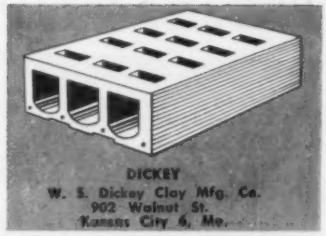
Symbol of good treatment

Filters

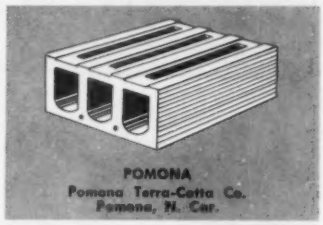
TFFI vitrified clay underdrain blocks are the greatest improvement yet introduced into trickling filter design. All consulting engineers should specify them. They provide maximum drainage and ventilation capacity. They are strong, durable, corrosion-resistant and easy to handle or lay.

Recommended Underdrain Specifications

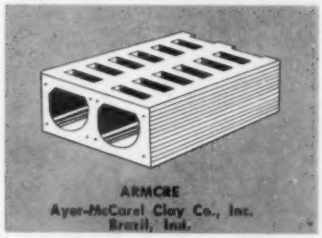
Standard Specifications for Vitrified Clay Filter Blocks for Trickling Filters are given in full on pages 37 and 38 of the 1954 revised edition of the HANDBOOK OF TRICKLING FILTER DESIGN. These specifications cover everything that an engineer needs to write specifications for trickling filter blocks.



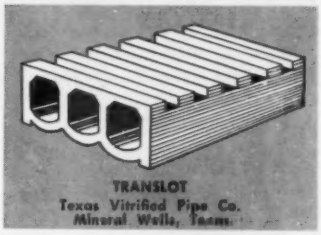
DICKEY
W. S. Dickey Clay Mfg. Co.
902 Walnut St.
Kansas City 6, Mo.



POMONA
Pomona Terra-Cotta Co.
Pomona, N. Car.



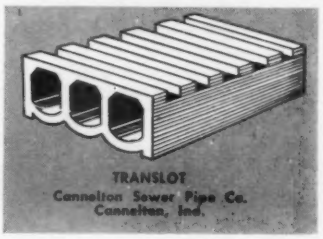
ARMCRE
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas

BOSCO
Bowerston Shale Co.
Bowerston, Ohio

NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.



TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.

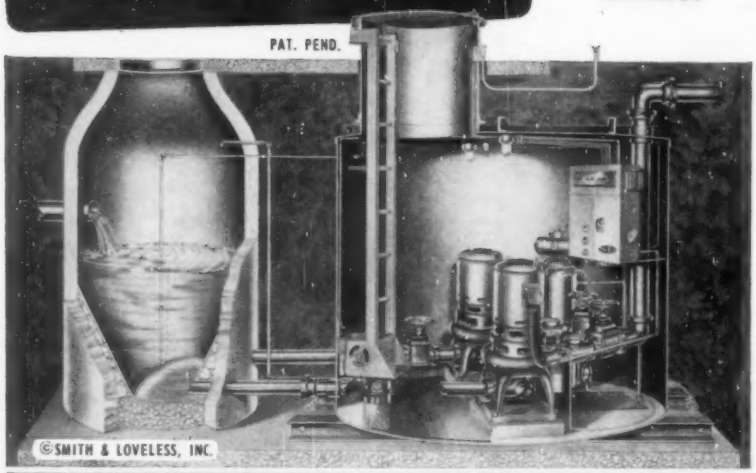
FLOOR INSTITUTE

HUNDREDS OF INSTALLATIONS—IN 27 STATES!

Specify—
The Smith & Loveless
FACTORY-BUILT PUMPING STATION

PROVEN QUALITY—
WITH FACTORY-BUILT SAVINGS

PAT. PEND.



THE MOST ADVANCED DESIGN IN SEWAGE PUMPING STATIONS

We specialize in building America's finest sewage lift stations. Acceptance proves their quality. Smith & Loveless offer you a complete line of six standard size lift stations with capacities from 20 GPM to 1600 GPM per pump or ejector. Larger capacity stations are built to your order.

- An integrated design, each piece proven by the test of time.
- Precision assembled by factory experts.
- Automatic dehumidifier to eliminate condensation.
- A central electrical control cabinet prewired and color coded.
- Shot blasted steel structure epoxy coated plus cathodic protection.
- Factory tested and adjusted by actual operation before shipment.
- Easily and quickly installed.
- Especially designed for minimum maintenance.

For Job Recommendations, complete specifications, and drawings—all part of the latest edition of the 100 page Smith & Loveless lift station Data Manual . . .

WRITE DEPARTMENT 40

S&L *Smith & Loveless, Inc.*
P. O. BOX 8172 KANSAS CITY, MISSOURI
Manufacturing Plant • Merriam, Kansas

REPRESENTATIVES IN PRINCIPAL CITIES

VIBRATION DAMAGE TO BUILDINGS

This is a request for any research information available on damage to buildings due to vibration from vehicular traffic on rough streets and railroad crossings.

John L. Allen,
Sup't. Streets & Sewers,
City Building,
Wichita, Kans.

GRANTS-IN-AID ON SEWAGE TREATMENT

The Public Health Service regulation 55.25 on "grant limitations" is as follows: "No grant shall be made for any work for which a contract was let prior to July 31, 1956." It is our opinion that the purpose of this requirement was primarily to exclude from grant participation construction and equipment expenditures made prior to enactment of the legislation. However, in practice this has been interpreted so as to affect seriously engineering contracts. As an example, in one case we executed an engineering contract in January, 1956, which included a preliminary report, fees for plans and specifications and supervision and inspection fees not applicable until construction began.

The Public Health Service is interpreting this regulation so as to exclude from grant participation the reports and plans and specifications fees. This appears to be reasonable and proper; however it is also excluding the general supervision and inspection fees. We do not believe this is correct nor was intended, for the following reasons:

(1). No expenditures have been or will be made until construction begins. (2). It is possible for the owner to cancel existing engineering contracts and engage a competitor at a saving of 30 percent because of government participation. (3). Engineering contracts entered into before it was determined that application would be made for a grant-in-

(*Please turn to page* 34)

MUELLER

AWWA GATE VALVES

give *tighter* shut-offs

Only Mueller Gate Valves have the exclusive "four-point contact" disc wedging mechanism. Closing pressure is equally distributed to four separate points near the outer edge of each disc. Shut-offs are made faster, easier and tighter - without disc deflection or sliding contact. See your Mueller Representative, Catalog W-96 or write today for full details on the complete line of Mueller Gate Valves.

Iron Body, Bronze Mounted
Double Disc, Parallel Seat Type
"O" Ring Seal or Conventional Packing
2" Operating Nut or Handwheel
Hub, Flanged, Spigot, Universal, Screwed, Mechanical Joint or "Ring-Tite" Ends
Sizes 2" through 48"

"O" Ring Conversion Kits now available for all Mueller Non-Rising Stem Gate Valves up to 12", which were originally equipped with conventional packing.

MUELLER CO. **DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller Limited, Sarnia, Ontario

MUELLER CO. 100th YEAR QUALITY SERVING the Waterworks Industry

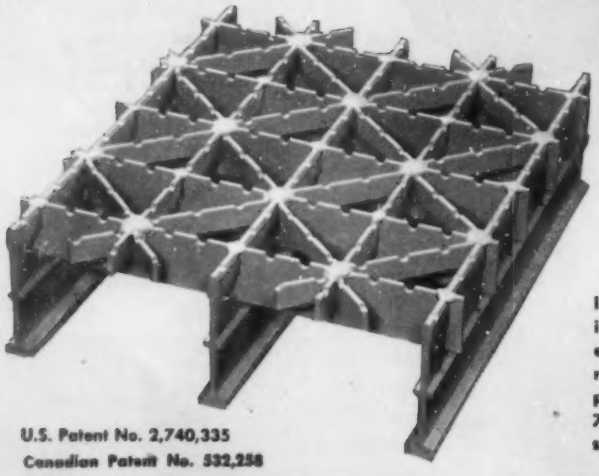
Since 1857

New GREULICH 4-way GRID

Holds Installation and

Skid-resistant, flat, serrated surface . . . . . .

Bascule bridge, New Iberia, La. Contractor: F. Miller & Sons, Lake Charles, La.



U.S. Patent No. 2,740,335
Canadian Patent No. 532,258

Greulich 4-Way Grids

Precision manufactured. Comes out square and rigid, assuring true alignment. Will not rack.

Integrally connected triangles extend over entire roadway insuring maximum lateral or horizontal rigidity and high skid resistance. They are especially adaptable for reflooring old bridges. Solid, 5-inch deep units remain true during shipment, handling and erection. Test data available proving resistance to distortion. Grids made in lengths up to 36 feet and 7 feet 3 inches widths to reduce number of units to be handled and field splices to be made between grids.

from KERRIGAN is Stronger and Quieter!

Handling Costs to a Minimum

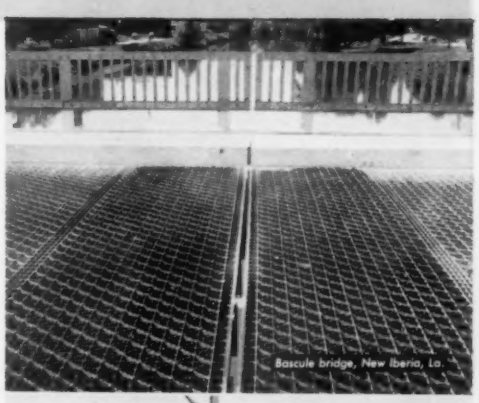
20% Fewer Field Welds in this NEW OPEN STEEL BRIDGE FLOORING

Illustrated here are several of the many Louisiana bridges recently floored with Kerrigan Iron Works' new Greulich 4-way grid. This design permits economy in field erection (without loss of strength) as main bearing members are spaced 7½ inches apart instead of 6 inches, thus requiring fewer field welds. Units are fabricated in panels 7 feet 3 inches wide to hold handling costs to a minimum and still permit hauling on ordinary flat bed trucks. The 4-way grid provides a flat, single plane, serrated surface—gives a straight, smooth ride and reduces tire hum to a minimum. Yet, due to triangular openings and scientifically located serrations in the top surface, it provides greater skid resistance.

In order to keep traffic moving on the bascule bridge shown at left units were cut to half-width areas, then welded together to form a solid, one piece, smooth surface.

This flooring is now being produced in our large, modern production plant, and a large reserve supply of materials is on hand to insure prompt delivery. For further information, write to our bridge flooring division.

Raceland and Thibodaux contractor: Austin Bridge Co., Dallas & Baton Rouge.



Address inquiries to: 1021 Herman St., Nashville, Tenn.

GREULICH Bridge Flooring Division

KERRIGAN IRON WORKS, Inc.

Harvey F. Neel, Manager, Bridge Flooring Division, Nashville, Tenn.
General Sales Office: 274 Madison Ave., New York City

Pier structure gets *New, Longer Life* with THORITE Nonshrink patch, THOROSEAL masonry sealer coat

Structural concrete suffers deterioration from the elements. If these surfaces had been protected from water penetration, freeze and thaw cycle would not have caused these maintenance problems. Workmen are shown cutting out defective areas, patching with THORITE without necessity of forming and then sealing surface with THOROSEAL.

THORITE 20-minute nonshrink, nonslump patching mortar has received international acceptance by men who know, Architect, Engineer and Contractor. THORITE requires no forming, permitting immediate completion of job.

"How to do it" GET OUR 16 PAGE BROCHURE

STANDARD DRY WALL PRODUCTS, INC.
NEW EAGLE, PENNA. *CENTERVILLE, IND.*

Letters—from page 30 . . .

aid do not reflect the increased cost of inspection and record keeping required by government participation, nor the necessity for plan revisions. Despite this, revision of agreements to allow for these extra costs will be difficult since the grant pays no part of these costs.

We believe the PHS should permit the execution of new engineering agreements providing for the cost of revising plans, engineering supervision and inspection on a participating basis, deleting only the amounts paid by the owner before the deadline.

Philip S. Davy, PE,
Davy Engineering Co., Inc.,
LaCrosse, Wisc.

• • •

Public Health Training for Professional Personnel

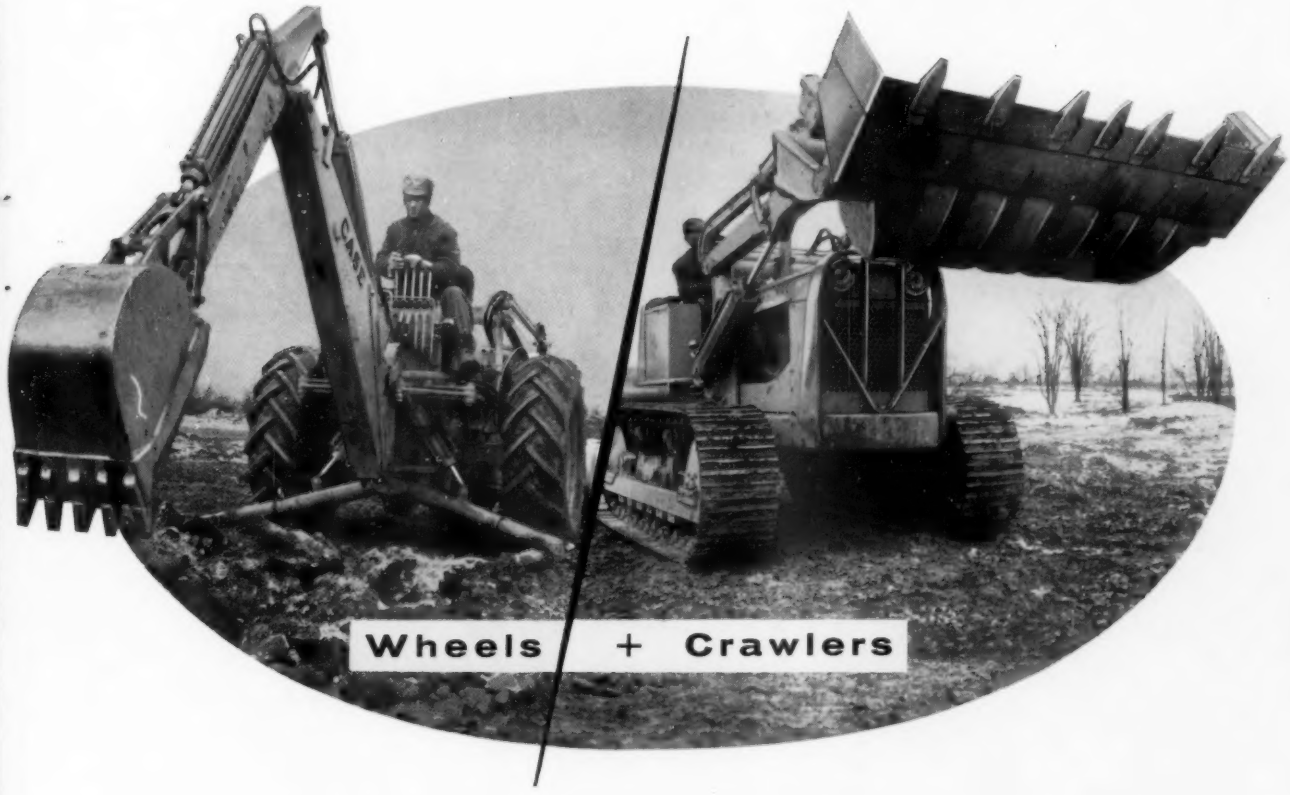
The Public Health Service program for training of professional personnel under Title I of the Health Amendments Act of 1956 will be continued. This training is open to those who have completed their basic professional education, but wish to obtain post-graduate degrees. Stipends vary from $2400 to $4800 per year. Engineers, scientists, sanitarians and similar groups are eligible. Considerable freedom in selection of training institution and details of the course are permitted to the applicant. Applications should be in before April 1, though it is possible to act on later applications. Address Chief, Division of General Health Services, Bureau of State Services, Public Health Service, Washington 25, D.C., or apply at any regional office of the Public Health Service.

• • •

Monument to Howard S. Morse

In tribute to his planning genius, the Indianapolis Water Company dedicated its newest impounding water supply reservoir to H. S. Morse, Board Chairman, as "the man of vision and technical experience and ability to provide the kind of leadership that metropolitan Indianapolis needed at the critical period of its most substantial growth in modern times." Pointing out that in an era when water shortage and rationing has been widespread, Indianapolis Chamber of Commerce President, W. Henry Roberts, stated that Indianapolis has continued to enjoy an abundant water supply. This was possible even though the peak daily demand increased from 50 to 91 million gallons in 15 years.

CASE + TERRATRAC®



NOW UNITED...to serve you better!

Recent consolidation of Case industrial wheel tractors and TerraTrac crawlers gives J. I. Case Company the *most complete line* of powered earth-moving and materials handling equipment in the 40 to 100 horsepower range. You now have a choice of 20 rugged Case-TerraTrac prime-movers — on both wheels and crawlers — plus over 50 combinations of mounted equipment — *100% Case-engineered, Case-built and Case-warranted.*

Back of this diversified tractor line are the tremendous resources of J. I. Case Company, with its 115-year reputation for dependable equipment, and *over 7,000,000 sq. ft. of modern production facilities.* Case even operates its own foundries, forge shops and engine plants, to insure more closely controlled quality at lowest possible prices.

Service-wise, too, Case is exceptionally well equipped, with in-stock parts and experienced personnel — "on call" through a world-wide network of independent dealers and factory-owned branches.

Let your nearest Case *industrial* dealer show you how Case service, combined with the many advanced features of Case industrial wheel-units and TerraTrac crawlers, can *help you handle a wider range of work at higher net profit in 1957.*

CASE

J. I. CASE COMPANY, Racine, Wisconsin, U.S.A.

Famous for quality for over 100 years

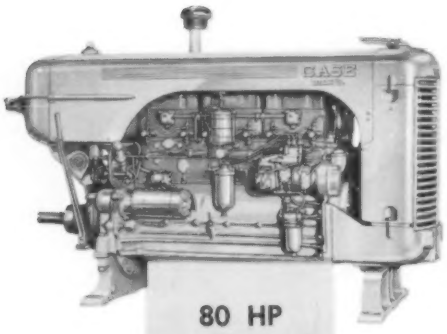
One of the world's five leading producers of powered equipment for construction • roadbuilding • industry • agriculture

NEW

80 HP
Gas & Diesel

100 HP
Diesel

...CASE-



80 HP

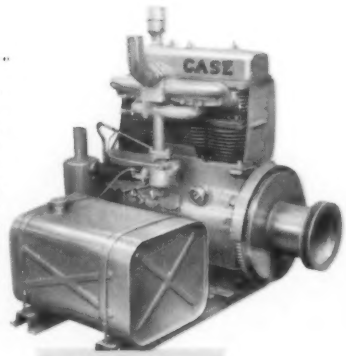
LUCKY is the man who OWNS ONE!

Spearheading the spectacular new Case industrial line are two powerful new *80 and 100 HP* TerraTrac crawlers that promise to change the entire concept of crawler tractor performance on *heavy-duty* earthmoving and materials handling jobs.

Most dramatic advancement in these new big-capacity TerraTrac crawlers is a new *counter-rotating* hydraulic transmission, which provides independent power-control of each track — both as to speed and direction. This *exclusive* patent-applied-for-feature, com-

ENGINES

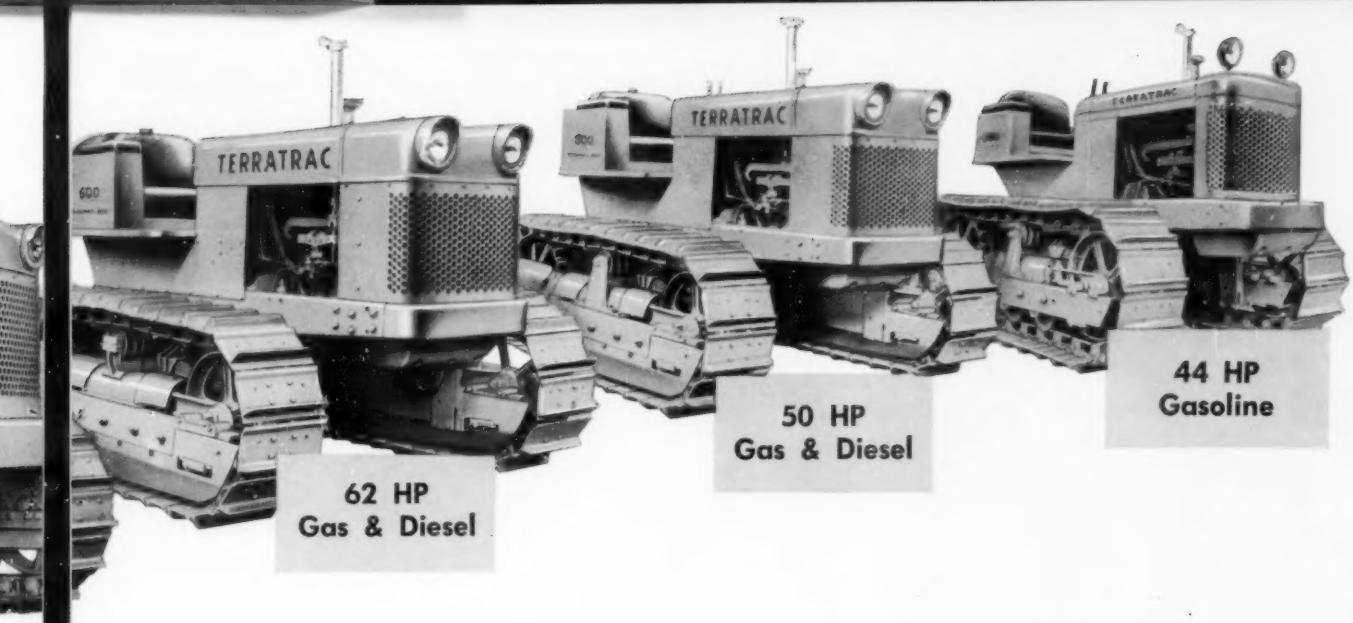
Case also builds a complete line of high-compression, hi-torque engines — from 30 to 80 gross HP, for powering pumps, rock crushers, and other industrial equipment. There's a Case-engine for every fuel — diesel, gasoline, natural gas or LP gas.



30 HP

60 HP
Gas & Diesel

Plus OVER 50 COMBINATIONS OF MOUNTED EQUIPMENT —



62 HP
Gas & Diesel

50 HP
Gas & Diesel

44 HP
Gasoline

TERRATRACS® up to 100 HP

bined with torque converter drive, instant power-shifting, power-steering, power-brakes, automatic track lubrication and torsion-bar suspension, give these rugged TerraTrac machines a combination of power, speed and ease of maneuverability that is *unmatched* in the crawler field.

In heavy-duty rubber-tired tractors, too, Case has taken the lead with three powerful new industrial models, ranging from 42 to 60 HP. *In the low-priced field,* only the Case Model 320 provides shuttle transmission, power-steering, drop-forged front axle, cushioned seat, *plus* industrial bumper and radiator guard. What's more, Case alone offers a *full range of matching equipment* — 100% Case-engineered, Case-built and Case-warranted — to help you handle more jobs, more profitably.

Whether it's the low-priced 42 HP wheel, or the sensational 100 HP crawler, your Case industrial dealer is ready to give the "*best trade in town*"—— *plus 1 to 2-year financing, with easy monthly terms.*

Write today for name of your nearest Case industrial dealer, who can give you the facts and figures you need on these new machines — to take full advantage of the booming construction and roadbuilding market in your territory.

J. I. CASE COMPANY, Racine, Wis., U.S.A.
Famous for quality for over 100 years

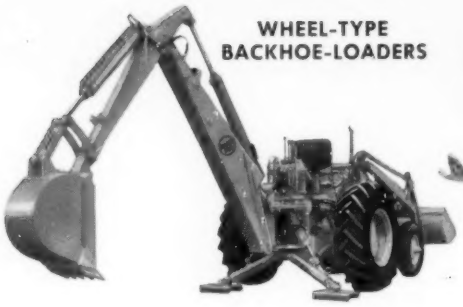
50 HP
Gasoline

42 HP
Gasoline

Printed in U.S.A.

100% CASE-ENGINEERED . . . CASE-BUILT . . . CASE-WARRANTED!

NEW



WHEEL-TYPE
BACKHOE-LOADERS

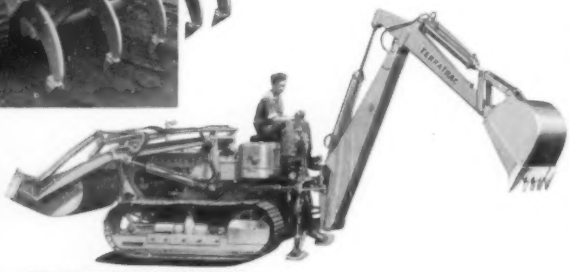
UTILITY WHEELER
WITH MOWER

CRAWLER-
LOADERS
½ to 2-cu. yd.

...CASE-BUILT EQUIPMENT

features sensational engineering advances

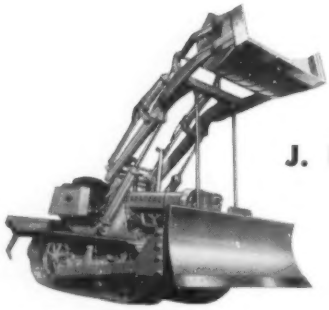
HYDRAULIC
SCARIFIERS



CRAWLER-BACKHOES

To increase your profit opportunities with the new 40 to 100 HP Case-TerraTrac crawlers and industrial wheel tractors, Case offers over 50 combinations of matching equipment including: new high-dump loaders from *½ to 2-cu. yd.* capacity . . . powerful angledozers that lift and angle *hydraulically* from the operator's seat . . . husky bulldozer blades that lift, tilt and tip *hydraulically* . . . heavy-duty backhoes with hydraulic foot-controlled 180° swing . . . materials-handling fork lifts . . . hydraulic mowers and powerful hydraulic scarifiers. What's more, *all* of this equipment is 100% Case-engineered, Case-built and Case-warranted, exclusively for use on Case-TerraTrac tractors, so you can always depend on *"undivided responsibility" in both performance and service.* This is just another reason why it will pay you to standardize on Case-TerraTrac machines — to increase your earnings this year and in the years to come.

CRAWLER
FORK-LIFTS

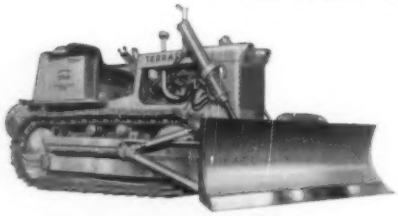


CRAWLER LOADER-
DOZER COMBINATIONS

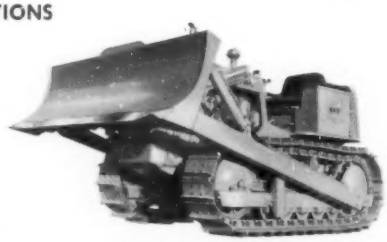
CASE

J. I. CASE COMPANY, Racine, Wisconsin, U.S.A.
Famous for quality for over 100 years

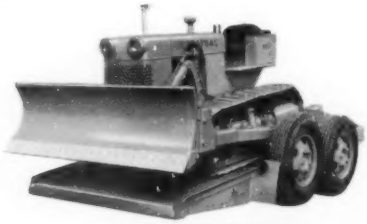
NOTE: Additional equipment, including winches, side-boom cranes and other special tools are currently available for use with TerraTrac crawlers and Case wheel tractors through various independent manufacturers.



CRAWLER-ANGLEDOZERS



CRAWLER-BULLDOZERS

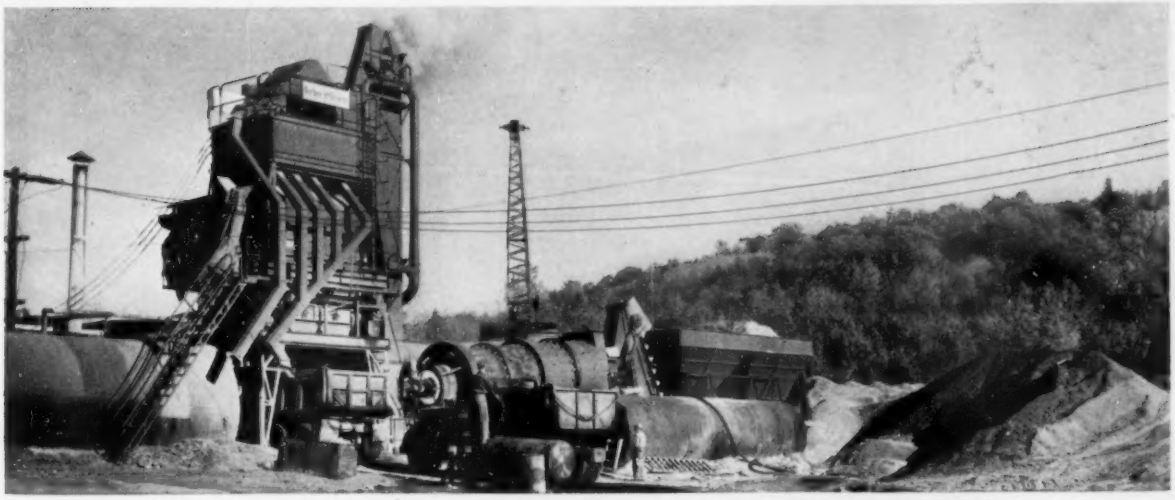


4 AND 8-TON
TILT-TRAILERS

CT-CL-2

7 Manufacturing plants . . . world-wide sales and service

On the Massachusetts Turnpike



Bigger tonnages with BatchOmatics

200 tons per hour—that's the kind of production Alexander Construction Co. is getting from its 6000-lb. BatchOmatic. This plant will produce 115,000 tons for a 13.4-mile section of the Massachusetts Turnpike.

Forty miles eastward a 4000-lb. BatchOmatic—one of three owned by Bayer & Mingolla—consistently produced at maximum tonnages.

Designed from their original conception for automatic operation, all three Barber-Greene BatchOmatic plants boost production, cut costs and expand the market.

Faster paving with a finisher team

Near Blandford, three Barber-Greene Finishers pave in echelon, laying 10′, 12′ and 16′ strips simultaneously. A fourth finisher paves interchanges.

Barber-Greene Finishers have always had the traction, maneuverability and control to take any job in stride.

And today's improved finisher has more power, paves faster, travels faster with lower maintenance cost. This is the finisher that sets the pace for quality paving over the world—the finisher that is now paving its second million miles—more than all others combined.

Write for information on the world's most modern equipment for building asphalt roads.

57-2-WB

Barber-Greene BG

AURORA, ILLINOIS, U.S.A.

CONVEYORS . . . LOADERS . . . DITCHERS . . . ASPHALT PAVING EQUIPMENT

New Tilt Cab line offers six series ranging up to 60,000-lb. GCW, up to 212 horsepower. Now, all the payload and maneuverability advantages of "cab forward" compactness, plus greater service accessibility and cab comfort.

Only Ford Gives You All These Deep-Down Modern Features

NEW Styleside pickup bodies, standard at no extra cost. America's biggest pickup bodies! Built wider with all-steel rugged box-section corner reinforcements.

NEW hydraulic clutch, standard in all models. Easier to operate—works like hydraulic brakes. Pedals are suspended type.

NEW riding comfort! A completely new chassis suspension, roomy cabs with increased visibility, greatly improved riding and handling ease.

NEW power advances! New higher horsepower, new freer breathing, new higher compression, new Super-Filter air cleaner. New advancements throughout!

NEW Driverized cabs—completely new—stronger, roomier, smarter! New wider full-wrap windshield. New inboard cab step, new Hi-Dri ventilation.

NEW chassis strength! New frames, up to 13% stronger. New sturdier axles! New higher capacity, easier riding springs!

NEW F-100 pickup with Styleside body standard at no extra cost. Flareside body with wood floor also available. Both types in either 6½- or 8-foot body lengths.

New '57 Fords

More modern...in more ways to cut your costs!

Boldly modern! That's the *big* news in Ford trucks for '57. Modern styling outside—modern engineering through and through. They're the most *efficient* trucks Ford has ever built—engineered to cut your costs.

Look at Ford's new line of Tilt Cabs . . . the lowest-priced* in America. And Ford's new pickup with smart-looking Styleside body has the biggest capacity in the half-ton field—*standard at no extra cost!*

Under the hood of a '57 Ford, you'll find important new advances in power. And every engine—V-8 or Six—offers the benefits of Ford's modern Short Stroke design.

Deep down it's a rugged truck, too! There's new toughness everywhere—stronger frames, sturdier axles, higher-capacity springs.

One look at these boldly modern Ford trucks for '57 will make you want to see just what they can do. Contact your Ford Dealer now!

**Based on a comparison of factory-suggested list prices*

FORD TRUCKS COST LESS

. . . LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

EQUIPMENT and MATERIALS

FOR YOUR

PUBLIC WORKS PROGRAM

NEW LISTINGS

Soil-Cement Construction Handbook

320. Soil-cement construction, road construction, street construction, airport paving, storage and parking areas, widening and shoulders, and inspection and field control are the subjects covered in this 102-page manual available from Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill.

All-Wheel Drive Heavy Duty Trucks

485. International all-wheel drive heavy-duty trucks for construction and maintenance work are described fully in literature from International Harvester Co., 180 No. Michigan Ave., Chicago 1, Ill. Check the reply card for models, gross vehicle weights and uses.

U. S. Tyton Joint Pipe

490. An eight page booklet on centrifugally cast, Tyton Joint pipe for water or other liquids has been announced. The newly developed Tyton Joint is simple, sturdy and tight. Illustrations show details of joint and method of assembly. Write U. S. Pipe & Foundry Co., Birmingham 2, Ala., or check the reply card.

All Purpose Attachment For "Quick-Way" Crane Shovels

378. A new interchangeable hydraulic grading-digging attachment has been announced by "Quick-Way". Two giant hydraulic cylinders and one hydraulic motor operate the reaching, digging and swivel action of the boom and bucket. The unit reaches high and low, digs and backfills, excavates and loads, grades horizontally or at any angle and it pushes and pulls. Write "Quick-Way" Truck Shovel Co., Denver, Colo., or check the reply card.

Aluminum For Bridge Railings and Extruded Highway Signs

482. This catalog is designed to provide consulting engineers, traffic and highway engineers with the latest information on Kaiser aluminum highway products. Covered are highway railings and highway signs and signs blanks. Write Kaiser Aluminum & Chemical Sales, Inc., 919 North Michigan Ave., Chicago 11, Ill., or check the reply card.

Better Mowing and Brush Removal

608. Fast, versatile tractor drawn Wood rotary mowers are available in a large selection of models to suit all types of municipal and highway department maintenance requirements. Be sure to investigate these units and discover how costs of roadside mowing, brush cutting, leaf mulching and park maintenance can be reduced with efficient equipment. Get full details by checking the reply card or from Wood Bros. Mfg. Co., Oregon, Ill.

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Effective Sweeping for Cleaner Streets

607. Outstanding features of Wayne Model 450 Sweepers are described in an attractive folder which covers operating advantages and general specifications. Data on dual control models are included. For your copy write Wayne Mfg. Co., Pomona, Calif.

Helpful Data on Distributors for Bituminous Materials

611. Pressure distributors featuring uniform pressure and temperature, accurate displacement pumping, convenient operation are described in literature of Standard Steel Works, North Kansas City, Mo.

A Completely Hydraulic Ladder

610. This completely hydraulic ladder is described in a new catalog published by J. H. Holan Corp., 4100 West 150th St., Cleveland 11, Ohio. Detailed drawing of the pedestals, throttle control and ladder construction are included. Check the reply card today.

Construction Methods for Salt Stabilized Roads

609. A comprehensive booklet showing modern methods of salt stabilization is available from the Morton Salt Co., 120 So. LaSalle St., Chicago 3, Ill. Stabilized secondary roads, base courses and shoulders are discussed and all equipment and construction methods are covered. Just check the reply card for your copy.

Principles of "BatchOmatic" Plants Explained

527. The unique principles of simultaneous and fully automatic aggregate and bitumen measuring followed on Barber-Greene's 2,000, 4,000 and 6,000 lb. "BatchOmatic" bituminous batch plants are explained with cut away drawings, charts and other illustrations in a 3-color bulletin offered by Barber-Greene Co., Aurora, Ill. Check the reply card.

Complete Sewage Treatment Unit for Small Cities

528. The application of the Aerator-Clarifier in completely meeting sewage treatment requirements for flows up to 0.5 MGD, which utilizes a number of automatic controls permitting part-time supervision is described in a 16-page bulletin, carefully prepared to provide essential design data. Bulletin 129 issued by the Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill., may be obtained by checking the reply card.

Flex-Beam Guardrail For Safer Highways

138. A new catalog on Flex-Beam guardrail that describes the requirements for good guardrail, and details the advantages of continuous flexible beam action inherent in the Flex-Beam type is available from Armco Drainage & Metal Products, Inc. Product Information Service, Middletown, Ohio. Check the reply card for reference data and illustrations.

Pipe Locators and Leak Detectors

262. The new Fisher utility catalog of M-scope electronic instruments for utilities has just been released. Included are the M-scope pipe finders, two new transistorized leak detectors, a completely new line of transistorized corrosion control instruments, and water well testing equipment. Write Fisher Research Laboratory, Inc., Palo Alto, Calif.

3-Way Ditcher-Terracing Blades

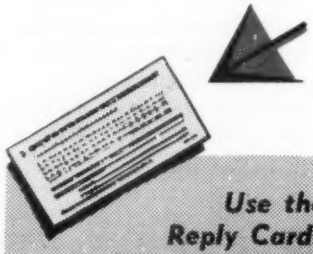
488. Servis heavy duty and standard 3-way ditcher-terracing blades with scarifier teeth, grader wheels and end plates for conversion to a leveling scraper are described in bulletin available from Servis Equipment Co., 1000 Singleton Blvd., Dallas 21, Texas. Check the reply card for specifications, design and application.

Crawler Tractor Shovels and Pull-Type Scrapers

55. Literature is available from Allis-Chalmers on their HD-11G and HD-6G diesel powered crawler tractor shovels and their four pull-type scrapers. Attachments for the tractor shovels are included along with views of each scraper model, and illustrations of the design features of the scraper line. Check the reply card or write Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Complete Line of Road Rollers and Compaction Equipment

520. Buffalo-Springfield's complete line of road rollers and compaction equipment is described in a 12-page illustrated Bulletin No. S-73-157 just released by Buffalo-Springfield Roller Co., Division of Koehring Co., Springfield, Ohio. Check the reply card for on-the-job pictures, as well as construction details of the 2-axle tandems, 3-axle tandem, 3-wheel rollers ad the K-45 Kompactor.



Use the Reply Cards For Prompt Service

CLEVELANDS dig 200 miles for water system in Gwinnett County, Ga.

Buchanan Pipe Line Company, Inc. of Birmingham, Ala. used 5 Cleveland trenchers to dig 200 miles of trench for a county-wide water system in Gwinnett County, Ga.—a multi-million dollar project requiring approximately 275 miles of pipe work. Digging 11" to 30" wide and 2½' to 4' deep in rolling terrain and in soil ranging from rock to sand clay, each of the 5 Clevelands averaged 3,000 feet of trench per day, working in wet weather.

Paul A. Buchanan, executive vice president of Buchanan Pipe Line Company, Inc., says this about Clevelands:

"We have bought 12 Clevelands since 1945, are now operating 6. Their performance has been entirely satisfactory, as evidenced by our repeat orders. In wheel-type machines we have standardized on Clevelands. We particularly like their simplicity of operation and maintenance and their good performance under adverse conditions."

Good Everywhere

THE CLEVELAND TRENCHER COMPANY

20100 ST. CLAIR AVENUE • CLEVELAND 17, OHIO

To order these helpful booklets check the reply card opposite page 70.

NEW LISTINGS (Cont.)

Valve Lubricant Bulletin Features 4 New Lubricants

103. A 12-page bulletin on lubricants for Rockwell-Nordstrom valves provides detailed lubricant selection data for 80 new lubricants. For your copy write Meter and Valve Div., Rockwell Mfg. Co., 400 North Lexington Ave., Pittsburgh 8, Pa., or check the reply card.

Pneumatic Transmission System

217. A colorful 8-page booklet, Bulletin 750, has been prepared by the Simplex Valve & Meter Co., Lancaster, Pa., describing the Laminair, a form of pneumatic transmission. The unit provides a sensitive and accurate type of instrumentation. Check the reply card.

Fence For Water and Sewage Plants and Maintenance Yards

338. Industrial type fences are described fully in 34-page catalog available from Anchor Fence Div., Anchor Post Products, Inc., Baltimore, Md. Terminal posts, drive anchors, frame gates and line posts are also covered. Check the reply card.

"The Dorrco Monorake" For Water, Sewage and Industrial Waste Plants

355. Dorr-Oliver Inc. announces the availability of a new 12-page, two-color bulletin, "The Dorrco Monorake". This bulletin describes the design, types and sizes, operation and advantages of this mechanism. Write Dorr-Oliver Inc., Barry Place, Stamford, Conn., or check the reply card for sketches, line drawings and installation photographs of the unit.

Cleaning and Coating Pipe Lines

529. A process which mechanically cleans and coats pipe in place for all sizes of lines to restore capacity and to prevent corrosion is the subject of a bulletin issued by Pipecote Service Corp., 3920 So. Peoria, Tulsa, Okla. Check the reply card.

Residual Chlorine Recorders For Water Plants and Swimming Pools

508. An instrument for measuring residual chlorine amperometrically in a continuous sample and recording the reading in parts per million on a 24 hour circular chart is described fully in literature available from Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J. Check the reply card today.

Structural-Plate Bridge Flooring

515. A 12-page catalog on USF structural-plate bridge flooring includes a general description of the flooring, step-by-step installation photographs, drawings of engineering details, design data and specifications. Check the reply card or write United Steel Fabricators, Inc., Wooster, Ohio, for your copy.

Weir and Flume Meters For Water, Sewage and Industrial Wastes

612. An illustrated 8-page catalog, published by Penn Instruments, Div. of Burgess Manning Co., 1004 Haverford Ave., Philadelphia 4, Pa., describes fully transmission meters, indicating and non-indicating transmitters. It also covers new and novel metering arrangements which have not heretofore been generally used in water and sewage plant installations. Check the reply card.

High Density Overlaid Plywood For Traffic Signs

613. Overlay plywood prevents checking; or grain raise; has a pleasing appearance; is durable; and panels can be carried in stock in full sheets and cut to size as needed. For complete data and specifications on overlaid plywood for traffic signs check the reply card or write Douglas Fir Plywood Association, Dept. 140, Tacoma 2, Wash.

Information on the Hydepak Refuse Packer

614. The Hydepak refuse packer is designed so that a lighter more economical truck body can be used and the packer is available in 13, 16, 20 and 24 yd. capacities. For complete specifications write Hyde Corp., P. O. Box 1265, Fort Worth, Tex., or check the reply card.

Data on Refuse Collection Bodies

615. The Hydro E-Z Pack compacting unit has only 2 working parts—a high volume roller bearing pump and a double-acting telescopic cylinder. A refuse-crushing compacting pressure of 82,500 lbs. is attained in the units. Write Hydro E-Z Pack Co., Galion, O., or check the reply card for complete specifications.

Plumber's Flushing Gun, Grease and Root Cutter

616. Literature describing a new unit called the Plumber's Flushing Gun that cleans clogged toilets, urinals, sinks and floor drains is available from Miller Sewer Tools, Dept. PWK, 4640 N. Central Ave., Chicago 30, Ill. Also included is literature on grease and root cutters for pipe up to 12 inches. Check the reply card today.

Fifty Combinations of Matching Equipment For Case-Terra Trac Tractors

617. Dump loaders, angledozers, bulldozer blader, backhoes, mowers and scarifiers are several of the attachments available for the 40 to 100 hp Case-Terra Trac crawlers and industrial wheel tractors. For complete information on the attachments and tractors write J. I. Case Co., Racine, Wisc., or check the reply card.

Warn Lock-O-Matic Hubs Manual

618. Warn Hubs make 4-wheel drive more useful, because they make it into a "free-wheeling" 2-wheel drive, as well as a 4-wheel drive. The Lock-O-matic hubs reduce front end wear, engine load and gear whine. Check the reply card or write Warn Mfg. Co., Riverton Box 6064, Seattle 88, Wash.

Champion Power Sewer Cleaners

619. Literature from Champion Corp., 4718 Sheffield Ave., Hammond, Ind. describes the Model C8-23R6 power sewer cleaner. Features include simplicity of operation, folding arch double pinned to allow lowering to either side or removal, safety features for operators and two speeds. Check the reply card.

BAUGHMAN SAND and CINDER SPREADER

SAFETY CHAMPION FOR STREETS AND HIGHWAYS
choice of 4 drives

PTO with { Mechanical Operation / Hydraulic Operation

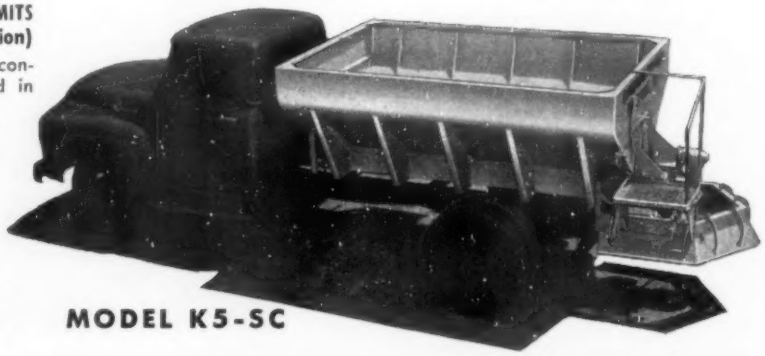
Auxiliary Engine with { Mechanical Operation / Hydraulic Operation

CAB CONTROLLED VACUUM CLUTCH PERMITS SPOT SPREADING (on mechanical operation)

Completely sealed, vacuum operation, controlled from cab. Start or stop spread in motion, as at intersections, safety zones. On hydraulic operation models, spot spreading is controlled by by-pass valve.

TWO-SPEED "QUICK CHANGE" MECHANISM

Simple sprocket and chain drive: low for chemical spreading, high for large-volume spreading. No need for expensive automotive transmission. On hydraulic opetation models, spreading volume is valve controlled.



MODEL K5-SC

WRITE FOR NEW ICE CONTROL CATALOG!

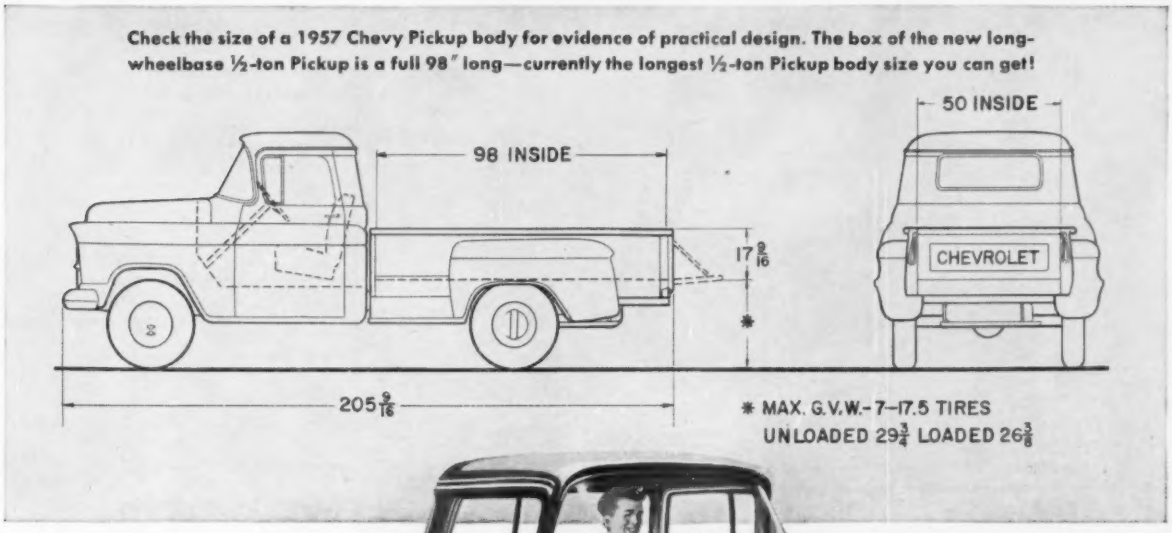
Distributors Wanted In Selected Areas

BAUGHMAN

BAUGHMAN MANUFACTURING COMPANY

224 ARCH STREET • JERSEYVILLE, ILL.

Pick a practical pickup!


Check the size of a 1957 Chevy Pickup body for evidence of practical design. The box of the new long-wheelbase ½-ton Pickup is a full 98" long—currently the longest ½-ton Pickup body size you can get!
50 INSIDE
98 INSIDE
17 9/16
CHEVROLET
205 9/16
* MAX. G.V.W.-7-17.5 TIRES
UNLOADED 29 3/4 LOADED 26 3/8

This big built-for-work "box" makes CHEVY first choice in Pickups!

These best selling '57 Chevrolet Pickups are practical trucks in every respect. They offer modern power to keep your costs down low, modern looks to keep your prestige up high... and all these modern body advantages to help you make light work of tough jobs!

They're the most practical and profitable Pickups going! For example, they enable you to load more easily and quickly, thanks to *low* loading height and steel skid strips in the long-lasting hardwood floor. And for your bulkiest loads, stake pockets accommodate the addition of racks or side boards. Other modern advantages include extra hauling space provided by *outboard wheel housings* . . . a grain-tight tailgate with anti-rattle latch that strengthens the sides . . . and practical level-ledge side panels. Chevy gives you running boards, too, for convenient side loading. These new Pickups come in a wide range of ½-, ¾- and 1-ton models with spacious boxes ranging up to more than 9 feet in length. See your Chevrolet dealer for the one that suits your job. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

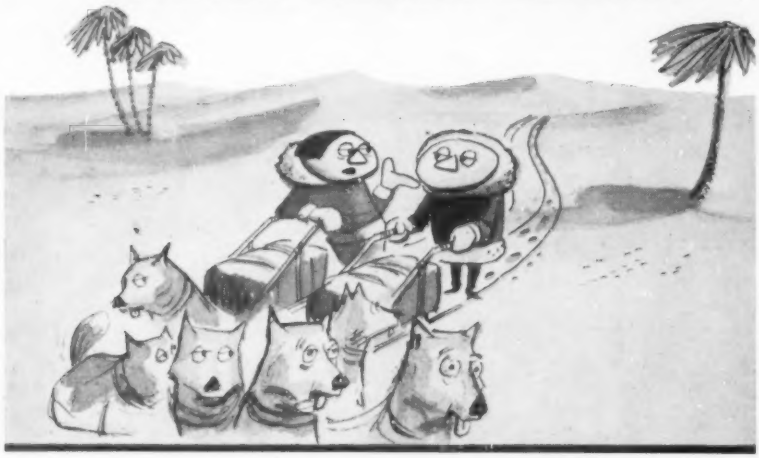
'57 CHEVROLET TASK·FORCE TRUCKS

PROVED ON THE ALCAN HIGHWAY . . . CHAMPS OF EVERY WEIGHT CLASS

CHEVROLET

NEXT TIME . . . GET AN

ALSTER AERIAL SURVEY!



Advance planning through an Alster Aerial Survey keeps your project on track — not bogged down like eskimos lost in the desert. Aerial mapping — usually 5 times faster than ordinary methods — cuts survey costs up to 75%, gets construction moving fast.

Send today for FREE BROCHURE!

ALSTER & ASSOCIATES, INC.
AERIAL SURVEYS

DEPT. P-11, 6135 KANSAS AVE., N. E., WASHINGTON 11, D. C.

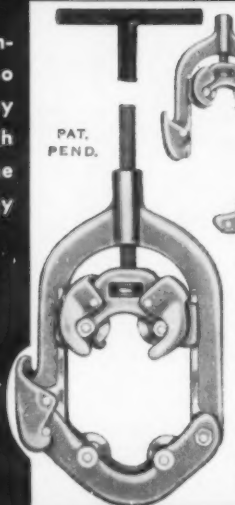
TOPOGRAPHIC • PLANIMETRIC • MOSAIC MAPS

IF YOU CUT LARGE DIAMETER PIPE . . .
YOU NEED THESE

New REED HINGED 4-WHEEL PIPE CUTTERS

Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

REED MANUFACTURING COMPANY
ERIE, PENNSYLVANIA • U. S. A.

Disposal of Brush and Tree Limbs a Problem? Here's your answer.

222. A new booklet, "The Modern Approach to the Brush Problem," shows how an Asplundh chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundh Chipper Company, 505 York Road, Jenkintown, Pa., or use the handy reply card.

Air Control Valves For All Types of Pipelines

620. Literature on air valves, air and vacuum valves and pressure air valves is available from Multiplex Mfg. Co., Dept. C, Berwick, Pa. Check the reply card for complete information on air valves that keep your pipelines open for safe, economical operation.

Complete Line of Surveying Instruments

621. A catalog from The David White Instrument Co., Milwaukee, Wisc. covers their complete line of surveying instruments. Pictorial and descriptive information of the instruments are included. Check the reply card.

Rotary Mowers For Roadside Maintenance

622. Rotary mowers that fit most makes of 4-wheel tractors are described in literature available from Danuser Machine Works Inc., Tulsa, Oklahoma. For complete information on these units for grass, weed and brush control check the reply card today.

Press-Seal Rubber Gaskets to Seal Joints of Concrete Pipe Sewers

623. Rubber gaskets for sealing the joints of concrete sewer pipe are described fully in literature available from Press-Seal Corp., P. O. Box 482, Fort Wayne, Ind. Check the reply card for information on how these gaskets prevent water infiltration in sewer lines.

Paints For Bridges, Water Tanks & Other Metal Structures

624. Flake silica graphite paints for outdoor metals are described fully in literature from Paint Sales Div., Joseph Dixon Crucible Co., Jersey City 3, N. J. Check the reply card for details on these primer and protective paints.

WATER WORKS

Waterstops For Expansion and Construction Joints

19. A polyvinylchloride waterstop "Durajoint", that is resistant to extreme waterhead pressures, tensile strength of not less than 1900 psi, chemically inert and available in easy to handle 50 ft. coils is described fully in literature from W. R. Meadows, Inc., 24 Kimball St., Elgin, Ill., or Tecon Products Inc., 304 S. Alaskan Way, Seattle 4, Washington.

Ball and Socket River Crossing Cast Iron Pipe

33. Literature is available describing Clow ball and socket cast iron pipe for river crossing, or any installation where full 15 degree free turning deflection is desirable. For full description and specifications, address James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill., or check the reply card.

Easily Cleaned Long Run Filter Bed Media

70. Bulletins on Anthrafilt tell the reasons why selected, graded crushed anthracite is superior to sand as a filtering material. Have you made a full investigation? Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

Comprehensive Bulletin on Swimming Pool Equipment

73. Fully illustrated 12-page Bulletin WC-109 of the Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y., gives complete descriptions of modern filtering and recirculating equipment and accessories for the treatment of swimming pool water. Many indoor and outdoor pools and their equipment are illustrated, and typical flow diagrams show engineering details. For your copy check the reply card today.

UTILITIES EXPECT MORE FROM POWERS *American*

Series 350
SERVICE-MAINTENANCE BODY
HANDLES 3 JOBS

Series 450
MAINTENANCE AND CONSTRUCTION BODY
Another unique design, ideal for municipalities!

DUAL PERFORMANCE . . .

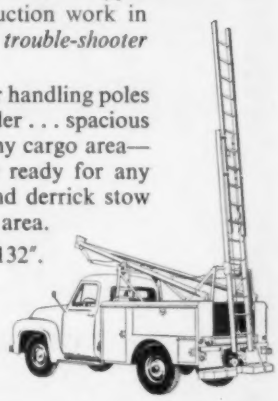
- Revolving aerial ladder for overhead work—revolves 360°—furnished in a height best suited to your needs.
- Underslung winch permits use of derrick—for handling 35′ poles—without interference to aerial ladder.

The Series 450 is available in 108″ and 132″ length.

This extremely versatile body will handle all types of service, maintenance, and construction work in small operations . . . and is an ideal *trouble-shooter* for larger utilites.

An easily-erected fold-over derrick for handling poles up to 35′ . . . a 24′ extension ladder . . . spacious bin-equipped compartments . . . roomy cargo area—all combine to make the Series 350 ready for any job at a moment's notice. Ladder and derrick stow above body . . . never obstruct cargo area.

In four lengths—84″, 90″, 104″, and 132″.



Get complete details and price information. Send for Powers-American Series 350 Bulletin #109R or Series 450 Bulletin #118 *today*.

McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY · ST. LOUIS 15, MO. • 625 CEDAR ST. · BERKELEY 10, CALIF.

To order these helpful booklets check the reply card opposite page 70.

Save Space By Filming Your Records

57. Microfilm your records by using the Recordak Microfilmer. Check the reply card or write Recordak Corp., 415 Madison Ave., New York 17, N. Y., for operation, use and price of this machine. Also available is literature on the Recordak Verifax Copier that makes certified copies 15 times faster than typing.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D. Wood gate valves.

Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp, Box 55-Station B, Buffalo 7, N. Y. Check the reply card for your information on these valve boxes.

Specifications for Infiltration Galleries

159. Infiltration galleries, constructed by the Ranney method, are described in an attractive bulletin issued by Ranney Method Water Supplies, Inc., 841 Alton Ave., Columbus 19, Ohio. This bulletin, plus complete standard specifications for the construction of horizontal infiltration galleries, are available by checking the reply card.

Heavy Duty Air Cooled Engines For Many Uses

223. Power and weight specifications, dimensions and uses are fully covered in literature issued by Wisconsin Motors Corp., Milwaukee 46, Wis., on their air-cooled engines. Also available is a service map and a list of their distributors and approved service stations.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their W-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the reply card and you will receive detailed information on a complete line of water works equipment.

Helpful Reference Catalog on Waterworks Gate Valves

146. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the reply card.

A Short Course In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the reply card.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Purification of Swimming Pool Water

153. An up-to-date 64-page manual on purification of swimming pool waters presents a comprehensive discussion of daily requirements, chlorine residuals and feeding methods for hypochlorites and HTH tablets. Available from Industrial Chemicals Div., Olin Mathieson Chemical Corp., Baltimore 3, Md. by checking the reply card.

Water Lines Under Pavements Easily Installed

247. With a Trojan pipe pusher and puller no resetting of grip is required, so the work goes twice as fast. Two models, for pipe up to 2" dia. The larger model is available with air power unit to eliminate manual pushing. Get full details by checking the reply card. Trojan Mfg. Co., 1114 Race Dr., Troy, Ohio.

Auxiliary Electric Power For Public Utilities

249. Full descriptive information on Onan electric plants for every public utility need will be found in bulletin A-292 issued by D. W. Onan & Sons, Inc., Minneapolis 14, Minn. Be sure you have latest data on standby plants and controls for emergency electric power.

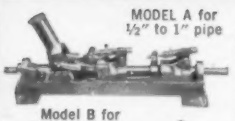
All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use reply card or write to Fairbanks, Morse & Co., Dept. P.W., Chicago 5, Ill.

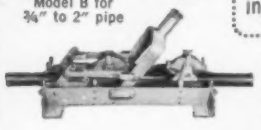
Engineering Data on Asbestos Cement Pipe

372. Advantages of corrosion-free asbestos-cement pipe for water distribution plus full data on installation methods, cutting, making connections, testing, dimensions and weights are contained in the booklet, "Mains Without Maintenance," issued by Keasbey & Mattison Co., Ambler, Pa. Get your copies by checking the reply card.

Only the
Trojan Pipe Puller & Pusher
gives you continuous action . . .
No Resetting of Grip!



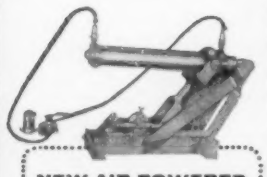
CUTS COSTS! SAVES TIME-
in installing or renewing pipe under pavement



The Trojan combines pushing and pulling operations in one machine—eliminates all time-killing resetting of grip—keeps pipe continuously moving. Does the job at lower cost—in far less time.

Model A weighs 65 lbs.—requires only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible.

Model B (either hand or air powered) needs only 5½' trench—has 3 speeds for different soils—is reversible in 30 seconds. Push pipe comes in 30" lengths, assures straight travel.



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TECHNICAL ADVANTAGES

- 1—Requires an average of 40% less wash water
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State's 150,000 signs are maintained by 18 two-man crews; central sign shop is in Madison.

The Traffic Services Section of the State Highway Commission of Wisconsin has experimented with every type of sign material on the market. On the basis of tests and field experience, it is now using considerable amounts of high density overlaid plywood for reflectorized highway signs. The commission cites these three reasons why:

1. Lower cost—Department figures on completed reflectorized signs show high density overlaid plywood enjoys a marked advantage over metal. A 30" overlaid plywood STOP sign for example, costs $1.05 less than 0.081" aluminum.

2. Durability, appearance, vandal resistance—The overlay prevents checking or grain raise, extends useful life of sign. The unpainted sign back surface has a pleasing appearance, and the material seems less subject to vandalism than metal, especially by shooting.

3. Adaptability—Panels can be carried in stock in full sheets and cut to size as needed with inexpensive shop tools. Larger size plywood signs require fewer posts and framing members than comparable sheet metal signs.

OVERLAID FIR PLYWOOD* GIVES YOU THESE ADVANTAGES:

- Combines strength, rigidity and workability of plywood with smooth, durable fused resin-fiber surfaces.
- Great resistance to severe weathering . . . accidents . . . gunshot, bending, other acts of vandalism. No progressive deterioration after damage. Cannot rust or corrode.
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*OVERLAID PLYWOOD is top-quality DFPA quality-tested Exterior fir plywood (EXT-DFPA®). Two types: (1) High density overlay is hard, glossy; (2) Medium density is opaque, with texture like drawing paper.

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Please send complete application-specification data for overlaid plywood for traffic signs.

Name_____

Firm or Dept._____

Address_____

City_____ Zone_____ State_____

To order these helpful booklets check the reply card opposite page 70.

Attractive Bulletin Features Large Elevated Tanks

252. In a 24-page booklet "Horton Elevated Steel Tanks of Large Capacity," Chicago Bridge & Iron Co., Chicago 4, Ill., describes the advantages of using large elevated steel tanks to provide gravity pressure in municipal water systems. Detailed information on radial-cone tanks of 500,000 to 3,000,000-gal. capacity and Hortonspheroidal tanks of 1,000,000 to 3,000,000 gal. is included in this really handsome bulletin. Check reply card for your copy.

Review of Diatomite Filtration of Water

285. A detailed review of the application of diatomite in the general field of water filtration, including uses in municipal supply and swimming pools is contained in a well-prepared 16-page bulletin. Specific applications to certain water treatment problems are also discussed. Write to the Dicalite Division, 612 So. Flower St., Los Angeles 17, Calif. for Bulletin F-552 entitled, "Diatomite Filtration of Potable Water," or check the reply card.

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 1246 from Norton Co., Worcester 6, Mass. by checking the reply card.

Swimming Pool Data Book

373. A 52-page book, profusely illustrated, containing data, photographs and prices of every item needed to build a new residential or public pool, or to equip and maintain an existing pool is now available. There is a section on proper pool care and maintenance and detailed descriptions of approved water treatment chemicals. Book is available by checking the reply card or writing to Modern Swimming Pool Co., Inc., 1 Holland Ave., White Plains, New York.

Modern Filtration of Swimming Pool Water

351. Latest data on filtration systems for swimming pools of 50,000 gallon capacity and over is presented in 24-page bulletin No. 625 by R. P. Adams Co., Inc., 226 East Park Drive, Buffalo 17, N. Y. Design and operating data are provided, together with material to assist you in choosing the right filter for your pool. Check the reply card for your copy of this helpful bulletin.

Testing Water Meters

353. This 40-page catalog is a discussion of fundamentals and a guide to sound practice in meter maintenance. It covers standard specifications of meter accuracy, descriptions of the latest developments in meter testing equipment and many drawings and diagrams. For your copy write The Ford Meter Box Co., Inc., Wabash, Indiana, or check the reply card.

For Prompt Service Use The Reply Card

Valuable Information On Prestressed Concrete Tanks

356. This helpful booklet describes the design uses and advantages of prestressed concrete in all types of storage tanks. Plenty of charts, diagrams and illustrations are included. Get yours from The Preload Company, 211 East 37th St., New York 16, N. Y., or check reply card.

Roll-On Joint Pipe For Water, Sewage or Other Liquids

388. American Roll-on Joint Pipe that is centrifugally cast in sand-lined molds for water, sewage or other liquids is described completely in catalog just released by American Cast Iron Pipe Co., Birmingham, Alabama. Applications, specifications, design, class, assembly and disassembly are included. Check the reply card.

Bulletin on Design Requirements for Clarifiers and Thickeners

179. Questions on design requirements of clarifiers and thickeners for a wide range of capacities and solids removal loads are informatively answered in this 16-page bulletin just published by Infilco Inc., Tucson, Ariz. Also, explained fully are why circular sedimentation basins, sludge scrapers and central inlet wells are features of these clarifiers and thickeners. Check the coupon today.

Helpful Data on Swimming Pools

364. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg. Co., Michigan City, Ind.

Complete Catalog and Reference Data on Valves and Fittings

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long.

How to Choose the Right Self-Priming Centrifugal Pump

427. Descriptive folders on the complete line of contractors' pumps have been issued by the Gorman-Rupp Co., Mansfield, Ohio. 2-in. to 10-in models are illustrated, performance tables are shown and pump selection tables are included to assist in choosing the proper pump for different jobs. Check reply card for your copies.

Important Factors in Water Meter Selection

463. Interchangeability of parts is an important advantage that is yours when you use Trident meters. The newest parts fit your oldest Tridents so you modernize when you repair. Get full data on the entire Trident water meter line by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.

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Every Municipal and Design Engineer needs this information
What clearances (headroom) should you allow for tine type grapples or clamshell type buckets?
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BLAW-KNOX BULLETIN 2350-R answers these questions and gives COMPLETE CLAMSHELL TYPE BUCKET AND TINE TYPE GRAPPLE SPECIFICATIONS for your guidance. Write for your copy today.
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MOUNTED ON 4 WHEEL DRIVE TRUCK

Sold as a complete unit or for your truck

- "Push-Pull" Power.
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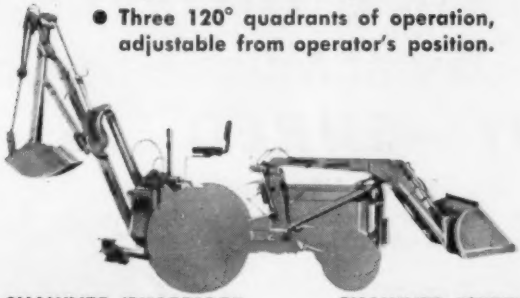

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2,000 pound lift to 9 feet dumping height. Two-pin mounting enables removing or mounting on the tractor in 5 minutes time. Many attachments available.

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1947 L North Topeka Ave., Topeka, Kansas

To order these helpful booklets check the reply card opposite page 70.

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement—tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

Engineering Data on Screening Equipment

77. Water, sewage and industrial waste screening equipment is fully described in a 28-page book, No. 2587, offered by Link-Belt Co., Dept. 137, Colmar, Pa. Complete data for the engineer and tables to determine the proper size unit for handling various capacities are included. This valuable, comprehensive booklet may be obtained by checking the reply card.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking the reply card.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included.

Engineering Data Manual on Underground Lift Stations

218. This manual includes descriptive bulletins, specifications covering typical installations for pump type or ejector type stations, friction loss tables covering capacities and size of pipe, pump and motor selection charts and wiring diagrams. Check the reply card or write Smith & Loveless, Inc., Water and Sewage Equipment, P. O. Box 8172, Kansas City, Mo., for your copy.

Use The Reply Card

Modern Methods and Materials For Jointing Sewer Pipe

402. In a compilation of reprints and related supplementary material, the Atlas Mineral Products Co., Mertztown, Pa., presents a comprehensive review of all types of sewer jointing materials and methods. You will find this interesting and informative reading. Get a copy by checking the reply card.

Sanitation and Process Equipment

420. The equipment for the separation of solids from liquids and for liquid clarification is fully described in Bulletin 51-83 available from Chain Belt Co., Milwaukee, 1, Wisc. Grit chambers and washers, thickener equipment, conveyor sludge collectors, sludge removers, skimmers and all types of liquid clarification equipment are covered in the bulletin. Check the reply card today.

A Pressure Proven Joint for Concrete Pipe

335. Investigate the Amseal Joint on low pressure concrete pipe for intercepting sewers, inverted syphons, sewage force mains and low pressure water supply lines. This folder is published by American-Marietta Company, Concrete Products Division, 101 East Ontario St., Chicago 11, Illinois. Describes concrete pipe for use in sewer and water lines where maximum operating pressure will not exceed 50 psi. Check the reply card today.

Getting Improved Sludge Dewatering With Non-Clogging Vacuum Filters

425. Latest information on the Komline-Sanderson "Coilfilter," which features non-clogging, permanent filter media to obtain constant output and low operating cost is presented in illustrated Bulletin No. 102 by the Komline-Sanderson Engineering Corp., Peapack, N. J. Be sure to investigate this improved method of sludge dewatering. Check the reply card today.

Solids Pump Uses Recessed Impeller

428. The Wemco "Torque-Flow" solids pump works with a completely recessed impeller which creates a vortex effect and transmits power exactly as in a fluid type torque converter. This avoids flow through impeller vanes and reduces clogging difficulties when handling sewage sludge or abrasive materials. For full details get Bulletin SP-10 by writing to Western Machinery Co., 650 Fifth St., San Francisco 7, Calif., or check the reply card.

Self-Propelled Backhoe For Water and Sewer Departments

470. For virtually every municipal, county and state lifting and digging job, the Bantam self-propelled Model CR-35 is the appropriate machine. It can lift up to 12,000 lbs. and dig up to 100 cu. yds. per hour. For more information write Schield Bantam Co., 234 Park St., Waverly, Iowa, or check the reply card.

(Continued on page 56)

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Mow More Miles Per Day at Much Less Cost

MOW — CUT — SHRED

MODEL T-280

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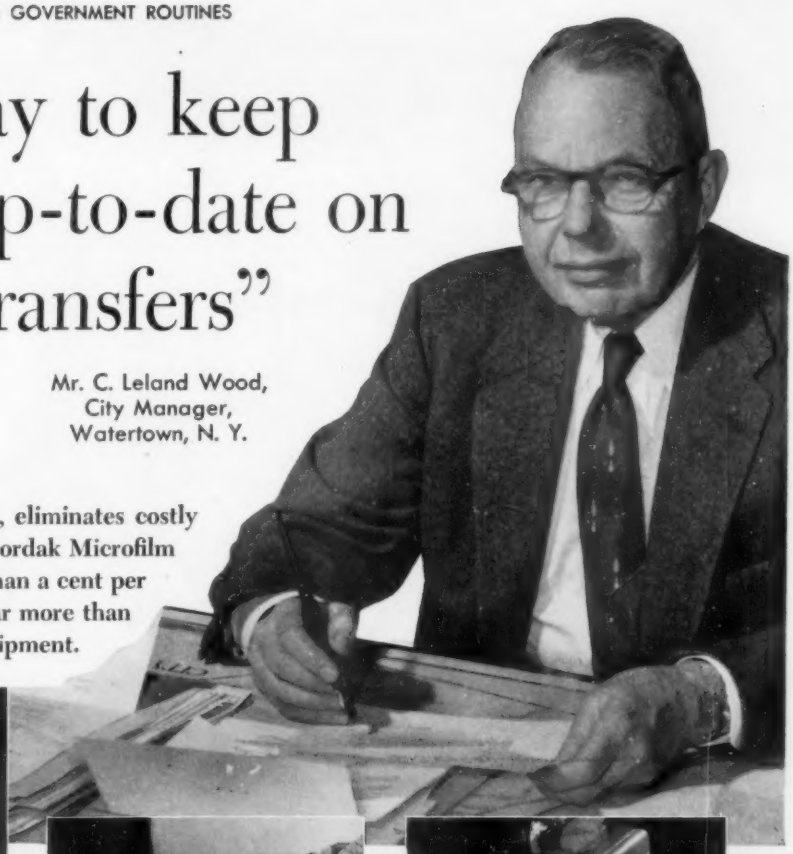

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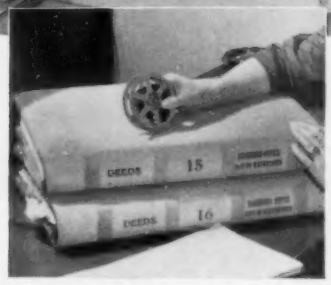
A Recordak Junior Microfilmer —installed in the County Clerk's office by the City—is used to photograph deeds for latest property transfers within Watertown limits. The picture taking is done in minutes by a member of the Assessor's staff, who stops by once a week. *Simple act of pressing* a button gives her a photographically accurate and complete record of each page. When film is sent to Recordak Processing Station, an extra positive film copy is ordered for City Engineer's Office.



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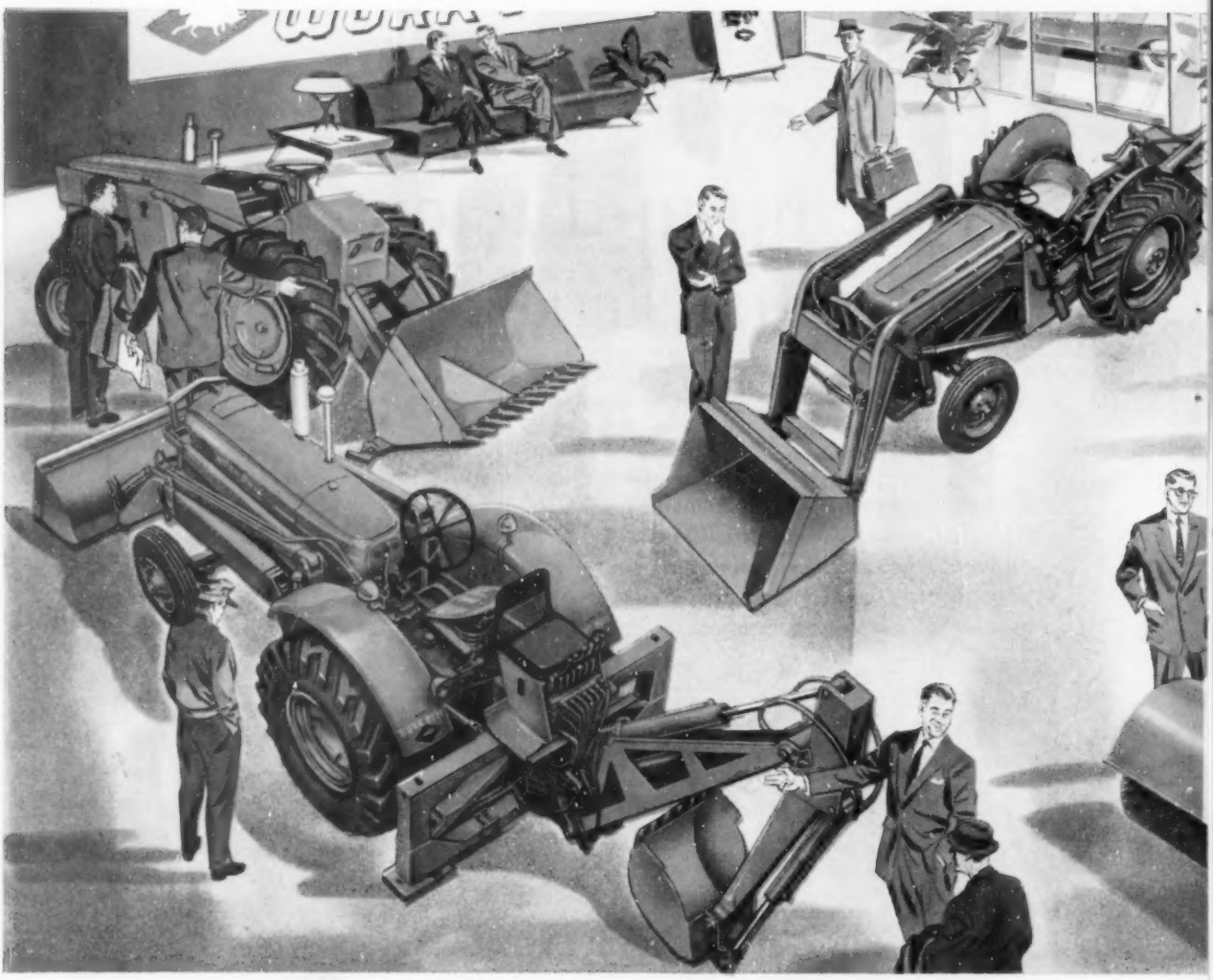

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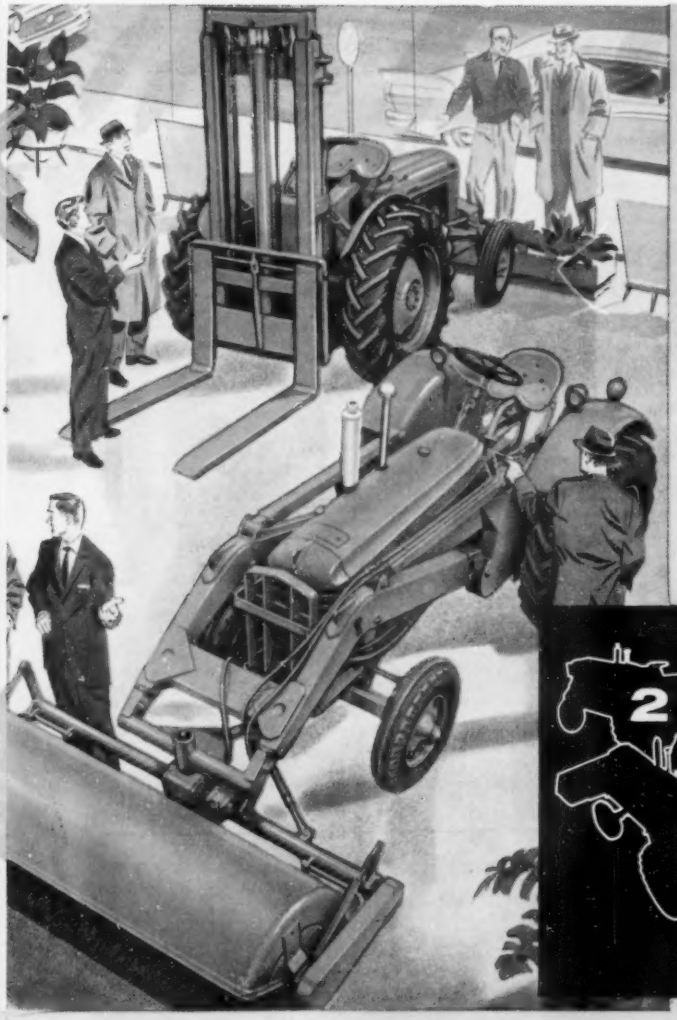
new family of power-matched packages

for scores of jobs



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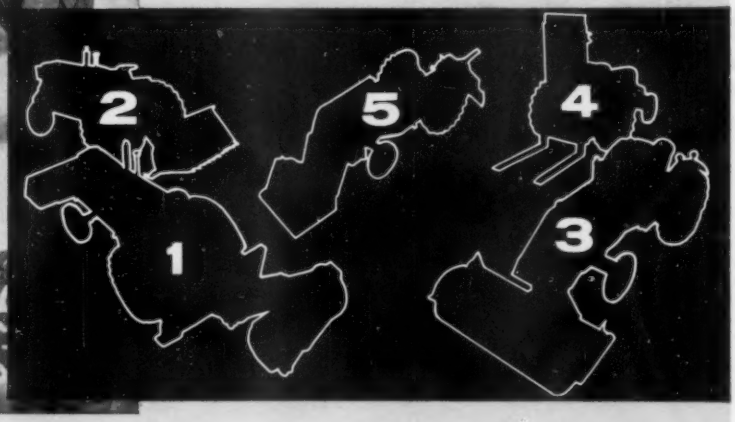
4. **Model 202 Fork Lift** with 10-ft. mast (Std.) for lifts of up to 4000 lbs. 21-ft. mast for lighter loads.
5. **34-hp** Work Bull Model 202 with rear-mounted multi-purpose, adjustable angle blade and . . . Model 102 loader with 11 cu. ft. hydraulic bucket and down-pressure cylinders.



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THE reason — integrated design! Both tractors and attachments are designed for *multiple machine versatility*. For example — a Work Bull with a loader also mounts more than a dozen other interchangeable attachments that quickly, easily convert the same tractor into a highly efficient backhoe, fork lift, swinging crane, grader or any of many other highly efficient tools. And at a surprisingly low cost!

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Check the list of Work Bull attachments. Choose the loader, blade, fork lift, mower, backhoe, snow plow, auger, broom, pipe and cable layer and others to meet your specific needs.

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And you have a single source, one responsibility for sales and service on both tractors and attachments!

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Division of Massey-Harris-Ferguson, Inc.

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To order these helpful booklets check the reply card opposite page 70.

Chapman
Standard Sluice Gates

276. Manual, hydraulic or electric motor control sluice gates are described fully in Catalog 25 available from The Chapman Valve Mfg. Co., Indian Orchard, Mass. These valves are easy to replace and are fitted without alterations. Check the reply card.

Catalogs on Horizontal and Industrial Service Pumps

477. Pump capacities, heads and horsepowers are fully described in Catalogs B-505 and B-1300 available from Peerless Pump Div., Food Machinery and Chemical Corp., 301 West Avenue 26, Los Angeles 31, Calif. For this information on how these horizontal and industrial service pumps can help you, check the reply card.

Butterfly Valves For Water and Sewage Treatment Plants

507. Rubber seated butterfly valves are described and illustrated in a new two-color Bulletin No. 5603, available from F. B. Leopold Co., Inc., 227 So. Division St., Zelienople, Pa. Complete details on the performance and construction features of the valve are included. Check the reply card.

Underground Pumping Stations, Complete Package Units

522. Pre-fabricated automatic underground pumping stations that are completely assembled for quick, economical installation are described fully in literature available from Schmieg Industries, Inc., Pumping Station Div., 23930 Sherwood, Center Line, Mich. Generous access space between pumps and accessible sump pump location are a few features.

Flow Tube For Metering Water and Sewage

541. The Gentile "Flow Tube" is described fully in Bulletin FT available from Foster Engineering Co., 835 Lehigh Ave., Union, N. J. Advantages, applications, drawings, head loss curves and other curves showing differentials for various ratios and velocity heads are included. Check the reply card.

STREETS AND HIGHWAYS

Bitumuls Paving Handbook Full of Useful Data

23. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalts for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the reply card. American Bitumuls & Asphalt Co., 200 Bush St., San Francisco 20, Calif.

How to Get Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the reply card for your copy.

Trenching Equipment Data Conveniently Assembled

212. The entire line of Cleveland trenching and backfilling equipment is now covered in a single bulletin, with material arranged for quick comparison of capacities, specifications and dimensions of all models. Twenty-four action photos graphically illustrate various job applications. Get Bulletin S-120 now for easy review of your trenching equipment needs. Just check the reply card or write to the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Paving Manual on Asphalt Hot-Mix Design

Authoritative instructions on mix design methods for hot-mix asphalt paving are furnished in a new 168-page pocket-size manual published by The Asphalt Institute. The Marshall, Hveem, Hubbard-Field and Smith Triaxial methods are outlined in detail; test procedure and interpretation of data are provided for each method; and information is given on gradation analysis of aggregates and on density and voids analysis of compacted paving mixtures. The price of this Manual is $1.00. To order, write direct to The Asphalt Institute, College Park, Md.

Finest Line of Markers for Fine Line Marking

165. Complete information on truck mounted highway markers, self-propelled line markers, all purpose line markers, and hand-propelled line markers is available from the M-B Corporation, New Holstein, Wis. Photographs and specifications of each type of line marker are included. For more, check the handy reply car.

Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the reply card today.

How the "Payloader" Helps Public Officials

190. An attractive booklet "Getting More for the Tax Dollar with Payloaders" makes worthwhile reading for every public official in charge of construction and maintenance of roads, streets, and utilities. You will find illustrations and data showing dozens of ways the "Payloader" is used by cities, counties and states, plus convenient specifications on seven models. Check the reply card or write Frank G. Hough Co., 761 Seventh St., Libertyville, Ill.

Weed control saves money here

Chemical weed and brush control pays off anywhere, but especially in hard-to-cut places like this. One spraying not only improves the appearance but saves hundreds of man-hours.

Whatever your weed and brush control requirements, DIAMOND has the information and the solution. As one of the world's largest makers of herbicides, DIAMOND has the experience and the facilities to help you select the right chemical formulation for the job. For information, write DIAMOND ALKALI COMPANY, 300 Union Commerce Bldg., Cleveland 14, O.

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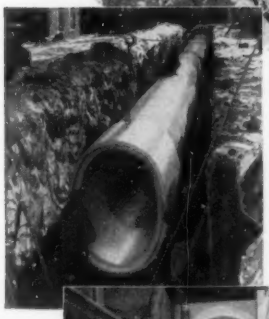

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To order these helpful booklets check the reply card opposite page 70.

CHANGE ELEVATION WITH MAN ON PLATFORM

New Holan Series 2500 Ladder gives you some of the benefits of a fully-hydraulic ladder at a price close to that of a mechanical ladder. Angle of elevation can be changed with a man on the platform.

For your copy of the 2500 catalog, use the coupon below.

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Please send me the catalog that tells all about Holan's Series 2500 Ladder.

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City_____

One-Piece Traffic Letter Mats

63. Brightly colored, flexible plastic, reflective traffic letter mats are described in literature released by J. W. Neff Laboratories, Inc., Stockertown 1, Pa. Check the reply card for information on how these mats are placed on the streets and highways and where they can be used.

How Accurate Boring Speeds Underground Pipe Installations

135. Interesting charts showing earth boring costs, speed and accuracy for holes from 2½" to 14¾" diameter and up to 80 feet long are included in 16-page Catalog No. 8 issued by Hydrauger Corp., 681 Market St., San Francisco 5, Calif. Specifications and general operating instructions are also covered. Check the reply card.

Literature on the Four-Wheel Drive Jeep Truck

144. The FC-150, "Forward Control" Jeep truck is described fully in literature available from Willys Motors, Inc., Toledo 1, Ohio. A few engineering features are 81-inch wheelbase, 18-ft. turning radius, 9 forward and 3 reverse power combinations and four-wheel drive. For complete specifications check the reply card.

Better Highways Through Salt-Soil Stabilization

162. Practical information for the men who build, repair and maintain our highways is provided in two bulletins issued by the International Salt Co., Inc., Scranton, Pa. General principles of salt-soil stabilization, applications, plant mix and road mix are described. Check the reply card for your copies.

"A Complete Package" of Road Building Equipment

261. A new catalog describing the road widener, trench roller and base paver has been released by Blaw-Knox Co., Construction Equipment Division, Pittsburgh 38, Pa. Illustrations, specifications and operation procedures are fully covered. Check the reply card today.

Use The Reply Card

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the reply card for your copy.

Four-Way Grid Open Steel Bridge Flooring

313. Grids are made in lengths up to 36 ft. and 7-ft. 3-in. widths. The 4-way grid provides a flat, single plane, serrated surface—gives a straight, smooth ride and reduces tire hum to a minimum. For full information on this skid-resistant flooring check the reply card or write Greulich Bridge Flooring Div., Kerrigan Iron Works, Inc., Nashville, Tenn.

New Acker Vane Shear Tester

367. A bulletin describing a new inexpensive accurate technique for obtaining "in-place" shear readings of soils is available from Acker Drill Co., Inc., Scranton 3, Pa. The shear test kit has a complete set of vane test tools for testing soils to depths of 100 ft., and operating information on this kit is covered in Bulletin 700, available by checking the reply card.

Advanced Tractor Design Gives Better Performance

399. The Ford Tractor offers 4-wheel stability, built-in hydraulic system, power take-off, as well as greater power, performance and economy. A complete booklet describes five tractor models in two power series, showing the latest in advanced tractor design and including many applications of equipment for saving time and money. For your copy check the reply card or write Tractor and Implement Division, Ford Motor Co., Birmingham, Mich.

Valuable Information On Aerial Surveys

437. What you should know about aerial surveys is described in detail in the latest literature just released by Alster and Associates, 6135 Kansas Ave., Northeast, Washington 11, D. C. Topographic maps, mosaics and planimetric maps by aerial photograph are fully illustrated. For more information check the reply card.

Truck Loader With Self-Loading Bucket

446. A self-loading bucket that will fit onto most all types of trucks is fully illustrated and described in literature available from M-B Corp., New Holstein, Wisc. Specifications and installation instructions are covered. Check the reply card.

Safti-Design Hi-Way Rotary Mower

454. A rotary mower that mows a full 60-inch swath and has the exclusive safti-design is described in catalog available from Sunflower Industries, Inc., Olathe, Kansas. Complete specifications on this mower and other information can be had by checking the handy reply card.

Hydraulic Backhoe For Many Makes of Tractors

456. A backhoe that digs sewer systems, culverts, water mains, foundations and ditches is described fully in literature from Henry Mfg. Co., Inc., 1700 N. Clay St., Topeka, Kans. Check the reply card for specifications and details.

The Trucks You Need for Every Public Works Job

461. Extra life and operating economies are built-in features of every Ford truck model. There's a chassis size and engine for each of your needs, from light utility work to heavy-duty construction jobs. Get latest literature from Ford Motor Co., Truck Div., Dearborn, Mich., by checking the reply card.

Information on 5 Versatile Tractors For Municipal and County Work

484. Tractors that find scores of highly efficient applications in construction, municipalities, utilities and related fields are described fully in a catalog just released by Massey-Harris-Ferguson, Inc., Industrial Div., Quality Ave., Racine, Wisc. Models, specifications, attachments and uses are covered.

Literature on 1957 Chevrolet Utility and Maintenance Trucks

579. Light and medium duty 1957 Chevrolet trucks are described fully in literature available from Chevrolet Div. of General Motors, Detroit 2, Mich. New features include modern versions of Thriftmaster and Jobmaster 6's and the short-stroke Trademaster V8's and the 283 cu. in. Taskmaster V8's. Also optional features are the Hydra-Matic and Powermatic transmissions. Check the reply card.

Case Histories of the Combination Tractair-Air Compressor

585. Four Tractair case histories are covered in this literature issued by the Le Roi Div., Westinghouse Air Brake Co., Milwaukee, Wisc. They are printed in three colors and using illustrations, describe the all-purpose Tractair as used on air application jobs, with or without the more than a dozen attachments available. Check the reply card.

●

SNOW AND ICE CONTROL

Spreading Equipment For Ice Control

543. An ice control catalog describing the full line of Baughman ice control spreading equipment has been released by Baughman Mfg. Co., Jerseyville, Ill. Included are illustrations and descriptions of truck-mounted spreader bodies, tail gate spreaders, dump body and pull type spreaders and gravity feed spreaders. For your copy of this helpful and interesting booklet check the reply card today.

RAVENNA, OHIO* chooses

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Rubber

PIPE GASKETS

to

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- ***PREVENT LEAKS***
- ***KEEP ROOTS OUT***

of new city sewers

When engineers and city officials decided on TYLOX Rubber GASKETS for jointing pipe of Ravenna's new sewerage, drainage and treatment plant expansion project, they took an important step in protecting public funds. Here's how their TYLOX specification assured Ravenna citizens of *most* for their waste disposal dollar . . .

FAST PIPE-LAYING to help keep construction costs down. TYLOX also permits pipe coupling in wet trenches, and laid lines can be backfilled immediately.

WATER-TIGHT JOINTS to prevent infiltration, thus keeping treatment plant loads at a minimum, and eliminating the chance of root and sediment penetration.

CORROSION-RESISTANCE to assure long service, free of joint failure. TYLOX is not affected by sewerage and industrial waste acids and alkalies. Under ground and under compression it lasts for the life of the pipe.

TYLOX Rubber Gaskets are the *one* pipe jointing material that fully meets the requirements of designer, builder and taxpayer alike. Specify TYLOX to speed pipe-laying and assure leak-proof, long-lasting pipe joints on your next project.

5055

* **PROJECT:** City of Ravenna, Ohio, sewerage, drainage and treatment plant expansion, Richard Miller, Service Director.

ENGINEERS: Karl Dussel, Ravenna City Engineer and Floyd G. Browne & Associates, Consulting Engineers, Marion, Ohio

CONTRACTOR: Tyson Construction Corporation, McLean, Virginia.

PIPE: TYLOX-Coupled Vitrified Clay Pipe, 8" to 27" diameters, manufactured by Universal Sewer Pipe Corporation, Cleveland, Ohio.

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CONSTRUCTION EQUIPMENT AND MATERIALS

Tractor-Shovels of Any Size and Bucket To Fit Your Need

21. Literature is available on 7 basic models of tractor-shovels that are gas or diesel powered, 44 to 165 hp., front, rear and all-wheel drive from Clark Equipment Co., Pipestone Rd., Benton Harbor 43, Mich. Check the reply card for information on 35 different buckets and attachments ranging from 6 cu. ft. to 5 cu. yds.

Information on The Ottawa Heavy-Duty Backhoe

25. Features of this backhoe are an automatic ejector bucket; two levers do four operations; and a powerful hydraulic system with mechanical linkage to provide more digging power. For complete details check the reply card or write Ottawa Steel Div., L. A. Young Spring & Wire Corp., Ottawa, Kans.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

Makes Underground Pipe Installation Easy

115. One-man operated hydraulic pipe pusher, pushes pipe through ground under streets, sidewalks, lawns and other obstacles. Pays for itself in man hours saved on first few jobs. For complete facts ask for Form E-213 Greenlee Tool Co., Rockford, Ill.

Check List for Successful Earthmoving Bids

147. Valuable information for the earthmoving contractor and for the engineer who must estimate earthmoving costs is provided in a new two-color illustrated booklet issued by Caterpillar Tractor Co., Peoria, Ill. A convenient check list is included to help select the proper equipment for the job. Check the coupon to get Form No. DE502.

Heavy-Duty Pipe Cutter Works In or Out of Trench

164. Built to stand the most severe service, the all-purpose Ellis & Ford pipe cutter, for cast iron water mains 4" through 12", is easy to use in tight places, works in or out of trench. Full details on cutter and interchangeable parts in Catalog 39, available by checking coupon. Ellis & Ford Mfg. Co., Ferndale 20, Mich.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 7 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the reply card.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air. For full details check the reply card.

Davis Back-Hoe and Davis Loader

312. Literature is available from Mid-Western Industries, Inc., 1009 S. West St., Wichita, Kans., describing the new Davis back-hoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors.

Do You Have Complete Black Top Equipment Data?

41. In 36-page catalog AA a full line of maintenance is covered. Units described and illustrated include several models of pressure distributors, supply tanks, sprayers, brooms, asphalt kettles, portable rollers, and accessory tools. Use reply card for copy of this handy manual. Littleford Bros., 452 E. Pearl St., Cincinnati 2, Ohio.

Inexpensive Ditcher Handles Heavy Diggings

91. The Shawnee Scout Ditcher, a heavier model for extensive digging, has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas. Just check the reply card.

Versatile Maintainer Has Year 'Round Usefulness

195. The Huber-Warco all purpose maintainer will work for you the year 'round on plowing snow, general sweeping and cleanup work, scalping berms and shoulders under guard railings, as a patch roller, berm leveler and highway mower. For full details on this piece of equipment write Huber-Warco Company, Marion, Ohio, or check the handy reply card.

Booklet Shows Design of Pre-Engineered Steel Buildings

271. Pre-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 16-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the reply card or write to Butler Mfg. Co., Kansas City, Mo.

Portable Melting Furnace For Rubberized Joint Sealers

357. The Hauck double jacketed melting furnaces use L-P as a fuel and a high flash point oil for heat transfer to assure close temperature control when melting rubberized joint sealers of all types. All details on this 16-gallon capacity unit are furnished in Bulletin 1081. Check reply card for your copy. Hauck Mfg. Co., 124 10th St., Brooklyn 15, N. Y.

Catalog on Utility Bodies and Equipment

360. General service bodies, line construction bodies, aerial equipment, winch and derrick equipment and trailers are the units covered in this catalog. For design, dimensions, illustrations and descriptions check the reply card or write McCabe-Powers Auto Body Co., 5900 N. Broadway, St. Louis 15, Mo.

Self-Propelled Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 524 T, and a new midget ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 524 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4½ feet deep. Full data on these ditchers available by checking the reply card.

Power Shovel, Crane and Backhoe All in One Unit

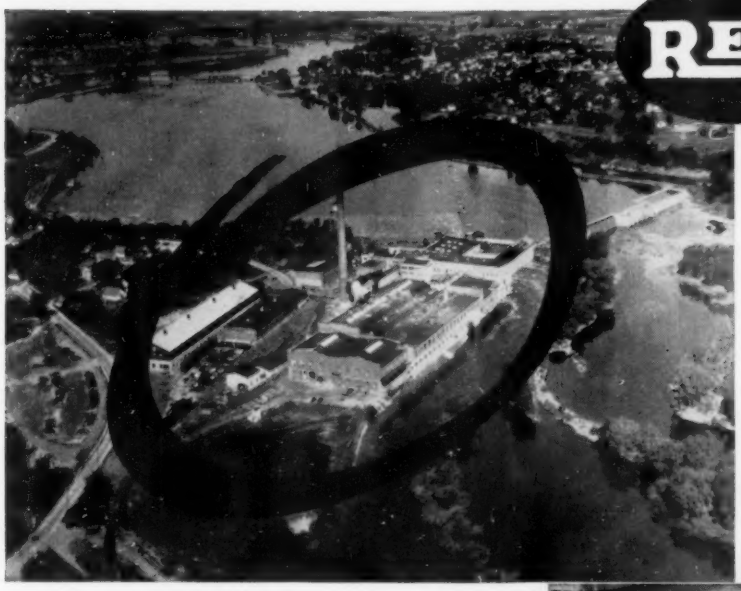
441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Machine Co, Winona, Minn. Also information on front-end loaders, truck and trailer mounted hydraulic backhoes and various attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the reply card.

One Man Field Tool Machines Any A-C Profile

475. Literature is available from Spring Load Mfg. Corp., 3610-D First Ave., South, Seattle 4, Wash., describing the Model B Spring Load A-C machinery and tapering tool. Also information on Spring Load A-C pipe cutters are included. Check the reply card.

Economical solution to a pollution problem

REX® VERTI-FLO®



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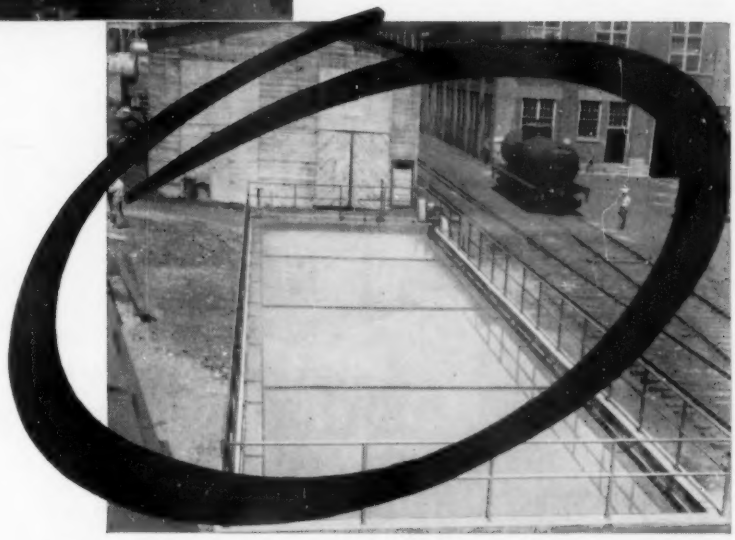
To eliminate pollution of the Fox River caused by de-inking plant waste... a daily 700,000 gallons with a high wood fiber and clay solid content.

ECONOMICAL SOLUTION

Rex Verti-Flo. The daily effluent of 700,000 gallons may now enter the river minus about ten tons of fiber and clay.



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Rex Verti-Flo is available in "packaged" steel tanks for smaller flows or in concrete tanks for larger flows. Why not get complete information? Send for your copy of Bulletin 315-92, "Packaged Industrial Waste Treatment." Write CHAIN Belt Company, 4722 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT COMPANY

Milwaukee 1, Wisconsin

To order these helpful booklets check the reply card opposite page 70.

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LIGHTWEIGHT
STEEL PIPE

Available in 6", 6⅝", 8", 8⅝", 10" and 10¾" diameters; 10, 12 and 14 gauge; 20, 30 and 40 ft. lengths.

Valley high grade, butt welded steel pipe is produced under rigid standards in the Midwest's first continuous steel pipe mills. Lightweight for fast, economical installation, plain or asphalt coated, choice of joints. Ideal for use in water and gas lines, irrigation systems, air-conditioning and heating conduit, well casings, heat exchangers, etc.

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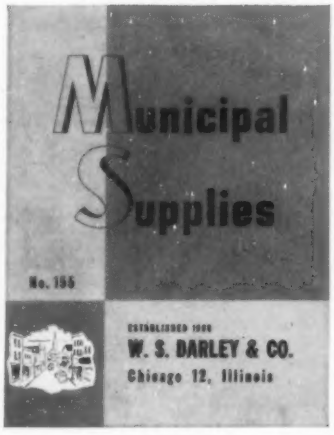

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W. S. DARLEY & CO.
CHICAGO 12

IHC Crawler Tractors For Highway Construction

491. Information on the new International TD-6, TD-9, TD-14 and TD-18 diesel crawler tractors is contained in 8-page, 2-color booklets available from Consumer Relations Dept., International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Mechanical features and specifications, engine power, and operation are fully covered. Check the reply card.

Joint Materials and Sealers Described in Latest Literature

492. Fibre material, asphalt board, cold pour joint sealer, crack fillers and concrete curing compound are described fully in literature available from Presstite-Keystone Engr. Products Co., 3906 Chouteau Ave., St. Louis 10, Mo. Check the reply card for information on these paving and building products.

Versatile Oliver Diesel Wheel Tractor

519. Powerful wheel tractor for construction and maintenance work is described fully in a catalog available from The Oliver Corp., 400 West Madison St., Chicago 6, Ill. Specifications, engine data and optional equipment are included. Check the reply card.

Agent For Improving Adhesion Between Old and New Concrete

530. Thorobond liquid bonding agent for improving adhesion of new concrete to old concrete walls, floors and ceilings is described in literature available from Standard Dry Wall Products, Inc., New Eagle, Pa. Check the reply card for information on typical uses and methods of application.

Catalog on John Deere Tractors and Equipment

588. Information and specifications on the John Deere "420" crawler and industrial tractors are fully covered in catalog from Deere & Co., 3300 River Drive, Moline, Ill. Attachments such as snow plow blades, rear-mounted blades, mowers and angling dozers are described. Check the reply card.

•

STREET LIGHTING AND TRAFFIC CONTROL

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy reply card. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

Information on Aluminum Lighting Equipment

296. Aluminum standards, brackets and lighting equipment are described fully in a catalog No. HAL-754 available from Hubbard Aluminum Products Co., Division of Hubbard and Co., Pittsburgh 1, Pa. Check the reply card today for information on poles designed for every outdoor lighting application.

A Guide to Effective Traffic Safety

468. A 20-page catalog with hundreds of illustrations of all types of signs used on highways and in motor and pedestrian traffic areas is offered to public works officials by Traffic and Street Sign Co., 84 Foundry St., Newark 5, N.J. This convenient reference covers all your sign needs.

•

WEED AND DUST CONTROL

Investigate "Tifa" For Insect Control

47. With "Tifa", the Todd Insecticidal Fog Applicator, chemicals are distributed as a true, clean fog. Use reply card for full data on public health programs. Products Div., Todd Shipyards Corp., Columbia & Halleck Sts., Brooklyn 31, N. Y., Greens Bayou, Houston 15, Texas.

How to Cut Weed Control Costs

308. Information on a weed killer that can save hundreds of man-hours of clearing and cutting is available from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio. Whether you want to control weeds or brush or both, without damage to crops or ornamentals, get this literature today by checking the reply card.

•

REFUSE COLLECTION AND DISPOSAL

New Roto-Pac Features Speed Refuse Collection

50. Features of the Roto-Pac refuse collection unit, which include automatic continuous loading and packing, with increased power to provide for larger loads in the same size body, are described in bulletins issued by City Tank Corp., 53-09 97th Pl., Corona, L. I. Check the reply card now to learn how your collection problems can be eased.

Efficient Material Handling to Reduce Incineration Costs

148. Blaw-Knox Buckets specially designed for refuse and garbage handling are described in 22-page Bulletin 2350-R. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Equipment Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa. Check the reply card.

Increasing the Efficiency of Bulk Rubbish Collection

177. Strategically spotted bulk containers can be handled by one man operating a Dempster-Dumpster equipped truck. Get full details of this cost-saving system of rubbish collection, as used by many cities to increase efficiency and eliminate unsanitary conditions. Write Dempster Brothers, Inc., 952 Dempster Bldg., Knoxville 17, Tenn., or use the handy reply card.

Catalog on the Flynn and Emrich Incinerator Stokers

180. This catalog describes the Flynn and Emrich Incinerator stokers as to design, feeding capacities and loadings. Plenty of drawings of the stokers and photographs of incinerator plants under construction and in operation are included. Also, there is a good section on the incinerator history. Check the reply card today for catalog No. 1702 from Flynn and Emrich Co., Holliday and Saratoga Sts., Baltimore 2, Md.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy reply card or write Combustion Engineering Inc., Raymond Div., 200 Madison Ave., New York 16, N. Y.

THE MAN WHO SAID *"No!"*

He's a business man looking for a place to build a new plant . . . a plant that will bring prosperity and growth to the community he chooses. Water supply is one of the most vital questions, and many a golden opportunity has been lost by a community because its water system is inadequate.

In Plattsburgh, N. Y., the story was different. Wasteful habits were causing water shortages, so Plattsburgh decided to install water meters. As a result, they "found" 1,400,000 more gallons daily . . . enough to supply a new Strategic Air Command Base now located there.

Even communities who have had meters for many years . . . but have allowed them to run down . . . can "find" more water simply by repairing the meters.

These savings are *real*. The meters give a strong money incentive for conservation. They help keep wells and reservoirs from running dry. The same filter plants and water mains may serve up to twice as many customers . . . with lower daily operating costs.

Your Neptune Trident meter representative will be glad to offer further evidence.

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Costs of city work seem too high?

LOOK HOW SANGAMO CONSTRUCTION CO. CUTS THEM

This well-known 30-year-old Springfield (Illinois) firm, a year ago, had a problem common to most city-area dirt-movers. Equipment transportation costs and traffic slow-downs were boosting the cost of all their municipal work. Small one-day or weekend jobs often couldn't be handled because their equipment was either too small to do the work fast or too big to move economically. Sangamo, however, found a solution. They bought three Michigan Tractor Shovels.

Drive, turn non-stop on narrowest city streets

All these units can be on their way to any kind of loader job in minutes. "These rigs go anywhere," says Clyde Turner, one of Sangamo's job superintendents. "They can run three or four blocks, through auto and truck traffic, in a minute or so. Twenty-seven miles takes only an hour. Rubber tires don't tear up asphalt or oil-mat pavement. They can even go up on a sidewalk without breaking it or the curbing. And our Model 75A's (which are 6′ 8″ wide and 16′ 10″ long) can turn around non-stop on the narrowest city streets."

Does job of bigger machines setting 12 inch sewer pipe

Often, one of the Michigans is assigned to a major job where maneuverability is a vital factor in speeding completion. Above picture shows typical task of this type —laying eight miles of 8, 10, and 12-inch sewer pipe for the city of Decatur (Illinois). Daily—almost hourly—this Model 75A shuttled between *three* crews. Tasks included pushing spoil away from trencher . . . back-filling . . . transporting and laying pipe. At times, it set manholes weighing 1200 to 1500 lbs per ring section. Biggest advantages proved to be speed (a typical half-mile trip took 75 seconds) . . . rugged construction (in a summer of work, no time was lost from the job for repairs) . . . planetary axles (which eliminated all axle breakage despite rugged lifting demands)

Carries 1800 lb water main section

Bigger loads have been no problem for the Michigans, either. Above, the second of Sangamo's 80 hp Model 75A's carries an 1,800 lb, 18 ft section of 20 inch water main. This unit *can* lift 8,000 lbs while standing still . . . can carry 4,000 lbs at 4 mph.

Clears, loads 1,000 yards of rubble in 1½ days

Sangamo's third Michigan Tractor Shovel, a 95 hp, 1⅝ yard Model 125A, also handles assignments where speed is important. Here it's on a historical job in Springfield—clearing the wreckage of Illinois' first governor's mansion to make way for a parking lot. Entire 1,000 cubic yards of rubble and dirt was piled and loaded out in 1½ days. Sangamo Construction bought this machine, their first Michigan Tractor Shovel, after having it demonstrated (to quote Company President, Bill Kewley) "on the toughest tractor shovel work we could find—digging up wet rocky ground to improve drainage around a Springfield sewage treatment plant. Later," Kewley continues, "it proved so handy and so dependable, all our crews wanted one. So, in 5 months, we bought our second Michigan, and 3 months later, our third."

Full buckets are the trademark of all Sangamo's Michigans. Here the Model 125A, bin-storing hot mix material, carries *more* than its rated 1⅝ yard capacity. Unexcelled breakout force, low-level tipback, and low-level-carry result in the delivery of big loads every time, the operator says.

Stockpiling gravel is another job for the busy Model 125A. While at this city-located yard, rig sometimes loads trucks and railroad cars, feeds the crusher, does cleanup. Its standard 1⅝ yard bucket, incidentally, is interchangeable with 2 yard light-material bucket.

The model 75A's standard 1 yard bucket interchanges with ¾ and 1½ yard sizes. Both models can also be equipped with crane hooks, fork lifts, backfiller blades, scarifiers and root rakes. For small jobs you can get a Michigan Model 12B with 6, 10, 15, 20, or 27 cubic *foot* capacity . . . for big jobs you can get a Michigan Model 175A with 1⅝, 2, 2¼ (standard), 3 or 5 cubic *yard* capacity. For help in determining which of these four models, or which of their 35 different buckets and attachments, *best fits your needs,* ask one of our job study engineers to study your layout. Feel free to call or write us any time for this service. It's free, of course and realistic . . . and will put you under no obligation whatsoever.

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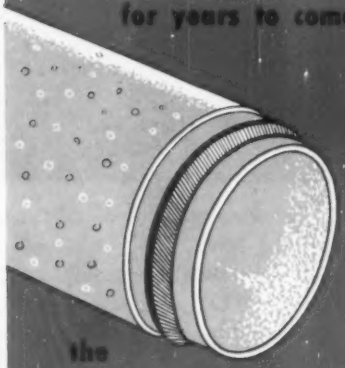
for years to come



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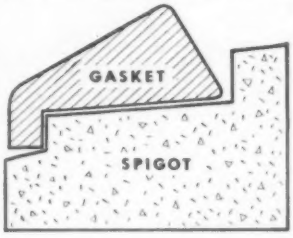

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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Keep Those Sidewalks on the Level

Swenson v. City of Rockford, 9 Ill. (2d) 122, 136 N.E. (2d) 777, an Illinois case decided May 23, 1956, shows the importance of keeping sidewalks in good repair.

On July 13, 1953, Mrs. Anna Swenson left her home to go to the Galluzzo Grocery and Market in the City of Rockford, Ill. She had lived in her home a few blocks from the grocery, for ten years, and had walked to and from the grocery four or five times a week during this time. But this time she fell on a piece of cracked sidewalk which had a two-inch ridge in it, and was injured.

In her suit against the City, she was awarded $15,000 by the jury. On appeal to the Appellate Court of Illinois, the judgment was overruled on the ground that Mrs. Swenson was contributorily negligent as a matter of law, since she was well aware of the defective sidewalk and could have avoided the injury with due care.

Finally, however, on appeal to the Illinois Supreme Court, the original judgment in favor of Mrs. Swenson was reinstated. Although it was established that she was well aware of the existence of the cracked sidewalk, the court held that this could not prevent her from using the sidewalk altogether, and that whether she was contributorily negligent or not under these circumstances was a question of fact for the jury.

When is a Rut not a Rut?

When it is only ⅞ inch deep, according to *Ness v. City of San Diego*, 301 Pac (2d) 410, a California case decided Sept. 26, 1956.

Violet Ness was injured as a result of a fall on a public sidewalk in San Diego. There was a ⅞ inch elevation of one slab with respect to the adjacent slab of concrete, and the City had notice of the defect.

In the trial, the jury awarded damages of $3,258.01 to the plaintiff, but the judge granted the City's motion against a judgment notwithstanding the verdict, on the ground that it was impossible as a matter of law for a ⅞ inch break in a sidewalk to be a danger to pedestrians walking with due care. Plaintiff appealed, but the judge's action was upheld.

The court discussed a number of other cases which shed further light on the question of how deep the break must be to be dangerous. Thus, it cited previous California cases to show that a ½-inch ridge was as a matter of law not dangerous, that a ¾-inch ridge was, as a matter of law dangerous, and that a 1-inch projection was as a matter of law not dangerous. As a result, it follows that, in California at least, a ⅞ inch ridge is not actionable. Q. E. D.

A Boring Case

Valentini v. City of Adrian, 79 N.W. (2d) 885, a Michigan case decided Dec. 28, 1956, was an action by a sewer contractor against the City of Adrian, for damages for excessive cost of constructing a sewer on account of the city's having allegedly misrepresented subsoil conditions, known to the City— namely quicksand and excessive water. Plaintiff claimed that this misrepresentation resulted in his low bid for the project, and that the unexpected subsoil conditions caused delay and greatly increased the cost of constructing the sewer. The jury gave plaintiff a verdict for $115,741.15 and the City appealed.

In 1950, the City had solicited bids for the construction of the sewer. The plaintiff obtained from the City's consulting engineers a copy of the proposed plans and

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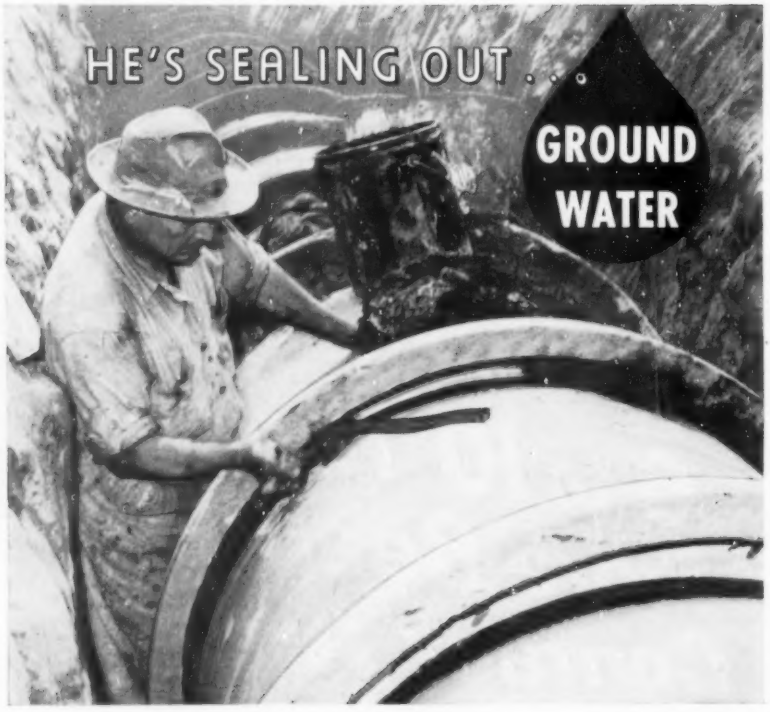

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specifications, and spent some time examining the job, but did not make borings or otherwise examine subsoil conditions. The city's proposed plans and specifications included the following statements:

"*Construction Conditions.* It is required that each bidder will examine the drawings and specifications for this work and make a personal examination of the site of the proposed work and its surroundings.

"*Sub-soil Conditions.* Borings have been made and logs thereof are recorded on the drawings. This information is offered to the bidder merely as evidence and the bidder himself must assume entire responsibility for any conclusions which he may draw from it."

The drawings referred to, however, did not show quicksand or excessive water conditions in the subsoil, although the conditions were well known to City officials, e.g. the foreman of the public works department of the City.

The appellate court upheld the jury verdict, saying: "The withholding by the city of its knowledge of the known conditions, resulting in excessive cost of construction, forms an actionable basis for plaintiff's claim for damages. Nor does the requirement that the contractor examine the specifications and make a personal examination of the site bar the plaintiff from recovering damages caused by the undisclosed subsoil conditions."

Although no reason is clearly stated for this result, other than the citation of judicial precedent, the reason is that an *intentional* deception is actionable if actually relied on, even if the reliance is not reasonable. If you intend to deceive someone and succeed, you cannot complain that he should not have believed you.

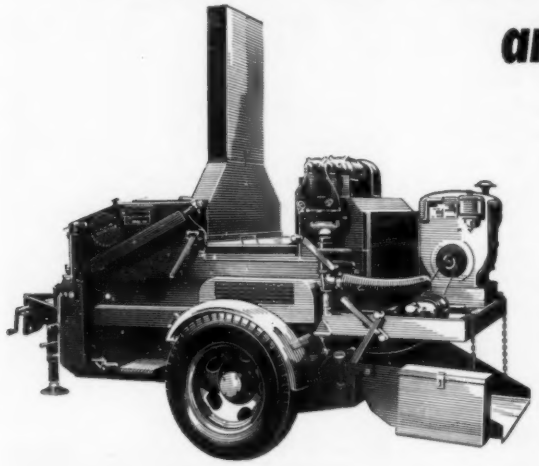
In a separate concurring opinion by two of the eight judges, a word of caution was expressed:

"We should not extend the present Michigan rule to allow a successful low bidder to transform his fixed-price bid into a cost-plus contract by the simple expedient of proving that conditions which he encountered below the surface of the ground had been there all along and that somebody at some time knew of them or had reason to suspect their existence."

However, the two judges who concurred in this statement nevertheless agreed that the City was liable, and the jury's verdict was upheld.

Give each crew its own asphalt plant

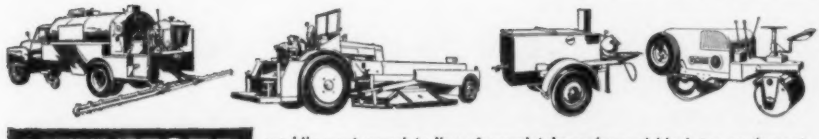
and save $2.29 on every ton!



The Littleford Trail-O-Patcher is a complete, self-contained portable asphalt plant. It's so convenient and economical, you can afford to give each crew its own bituminous mixer.

In fact, when you consider the $2.29* per ton saving, it will pay you to keep several Trail-O-Patchers on the job continously. Mix as much as you want, anywhere, any time.

To appreciate the convenience, efficiency and economy of the Littleford Trail-O-Patcher, send for free copy of bulletin 28. Littleford Bros., Inc., dept. LB 178, 452 E. Pearl St., Cincinnati 2, Ohio.



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Atlantic City, N. J., March 13-15

Southeastern Section, AWWA
Charleston, S. C., March 17-20

Arkansas Water Works Ass'n
Little Rock, Ark., March 18-20

Illinois Section, AWWA
Chicago, Ill., March 20-22

Arizona Sewage and Industrial Wastes Ass'n
Mesa, Arizona, April 4-6

Montana Section, AWWA
Great Falls, Mont., April 5-6

Kansas Section, AWWA
Wichita, Kans., April 10-12

Kansas Sewage and Industrial Wastes Ass'n
Wichita, Kans., April 10-12

New York Section, AWWA
Elmira, New York, April 10-12

Nebraska Section, AWWA
Lincoln, Nebr., April 24-26

California Sewage and Industrial Wastes Ass'n
San Diego, Calif., May 1-4

Pacific N. W. Section, AWWA
Tacoma, Wash., May 2-4

Washington State Ass'n of County Comm'rs & Engrs.
Walla Walla, Wash.,

American Water Works Association
Atlantic City, N. J., May 12-17

Maryland-Delaware Sewage & Industrial Waste Ass'n
Ocean City, Md., May 22-24

Pennsylvania Section, AWWA
Bedford Springs, Pa., June 12-14

International Municipal Signal A'ssn, Southwest Section
Amarillo, Texas, June 13-15

Ohio Sewage & Industrial Wastes Ass'n
Dayton, Ohio, June 19-21

Central States Sewage & Industrial Waste Ass'n
Chicago, Ill., June 26-28

Pennsylvania Sewage & Industrial Wastes Ass'n
State College, Pa., August 27-29

New England Water Works Ass'n
Boston, Mass., Sept. 15-18

International Municipal Signal Ass'n
Miami Beach, Fla., Sept. 16-19

Public Works Congress and Equipment Show
Philadelphia, Pa., Sept. 22-25

Federation of Sewage and Industrial Waste Ass'ns
Boston, Mass., Oct. 7-10

American Public Health Ass'n
Cleveland, Ohio, Nov. 11-15

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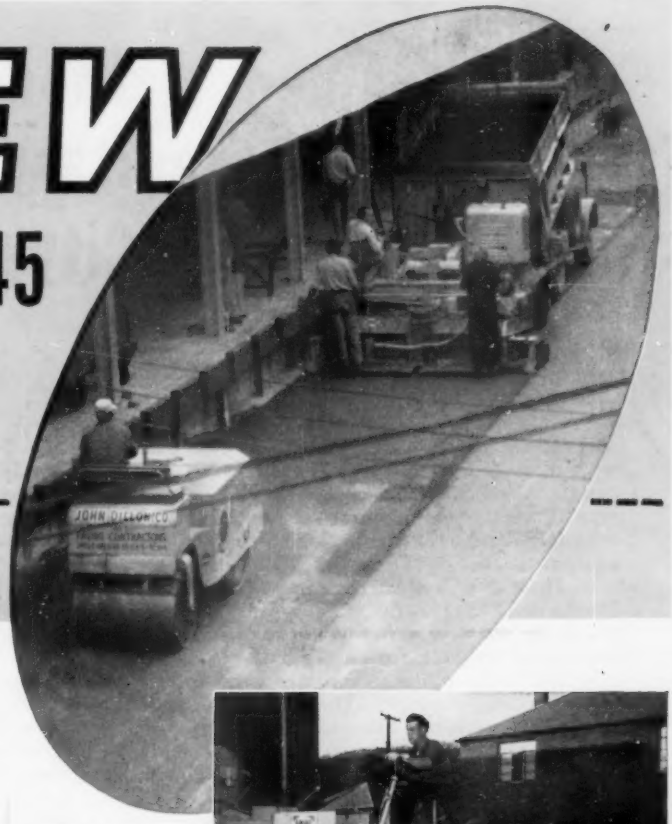
BLAW-KNOX PF-45 Black Top Paver

gives you proved performance

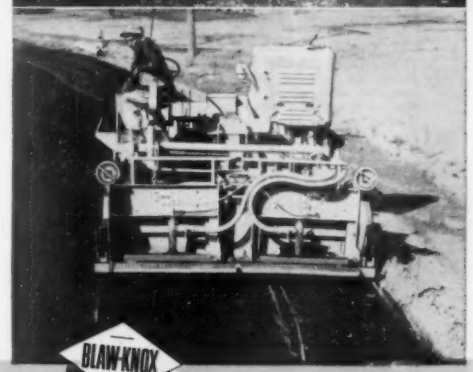


Chicago Freight Yard. Limited clearance next to this loading dock would be a problem for other pavers but not for the PF-45. This smooth paving is laid over rough cobblestones.

Many hours of production on all types of small to medium size black top paving jobs in several cities have proved the profit potential of the Blaw-Knox Model PF-45. On numerous jobs where the PF-45 had to work in confined areas such as school yards, driveways and around freight loading docks its speed and maneuverability made fast work of what would ordinarily have been slow and costly hand spreading. Contractors who have used this Black Top Paver like its combination of self-power and its 4-ton hopper that allows it to work in tight areas. They also like its power to push big trucks and to give high travel speed which eliminates the need for trailoring the machine on short between-job-moves.

The combination of low investment and low operating cost assures owners of big savings on every small to medium paving job. The Blaw-Knox Model PF-45 incorporates many of the economy features of its big brother, the Model PF-90 which is designed for the larger paving jobs. Most important of these features is the combined rubber tire-mounting and floating screed action which eliminates deflection in paving surface. Plan on these economies on your paving jobs this season.

Pittsburgh Housing Area. An areaway and playground would have had to be paved by hand since it required maneuvering in narrow driveways without damaging lawns and shrubs.



Cleveland Streets. On this job the Model PF-45 proved it could handle street paving as well as work in confined areas.

For complete information see Bulletin No. 2539. You can get it from your nearest Blaw-Knox Distributor or by writing direct to Blaw-Knox Company.

BLAW-KNOX

BLAW-KNOX COMPANY

Construction Equipment Division

43 Charleston Ave., Mattoon, Illinois

This Proved Method is Whipping Costly....Unsanitary Refuse Conditions in City-After-City!

AFTER AGE-OLD CONTINUOUS BATTLE with costly, unsightly and unsanitary refuse handling and collection conditions in our cities, man is finally winning out—thanks to the development of the remarkable Dempster-Dumpster equipment and the Dempster-Dumpster System.

Here is a method that provides a mobile Dempster-Dumpster, operated by only one man, the driver, to serve scores of big steel detachable containers, one-after-another!

All conventional and inadequate cans, crates, boxes, drums, etc. are removed from the commercial areas and eliminated! Big Dempster-Dumpster depositories, each with self-latching doors, are placed at strategic locations behind department stores, food markets, business establishments, hotels, schools, hospitals, housing and apartment areas, etc.

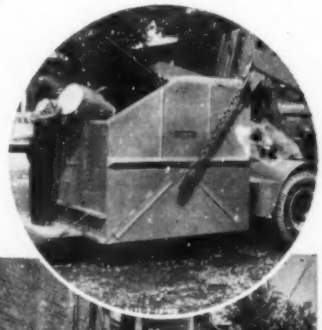
As any and all things are discarded, they are placed in a nearby Dempster-Dumpster Container—never to be touched again by human hands—never to cause fire or health hazards—never to litter the streets and alleys—never to become the feeding and breeding place for rats, flies and scavengers—never to demand large expenditures for re-handling and collection by crews for hauling and final disposal at the dump!

Savings produced by the Dempster-Dumpster System in almost 100 cities where it has thus far been installed usually range from 50¢ to 90¢ on the dollar, depending on the equipment and method this modern system replaced.

Average small city figures labor savings alone pays for the equipment in the Dempster-Dumpster System in nine months to four years, depending on the installation required.

To determine the number of these big containers desired, each city calls on Dempster Brothers' engineers to make a survey. This survey which is made at no cost or obligation to the city, determines correctly the number and sizes of containers needed, the recommended locations of containers and the amount the cost of refuse handling can be reduced.

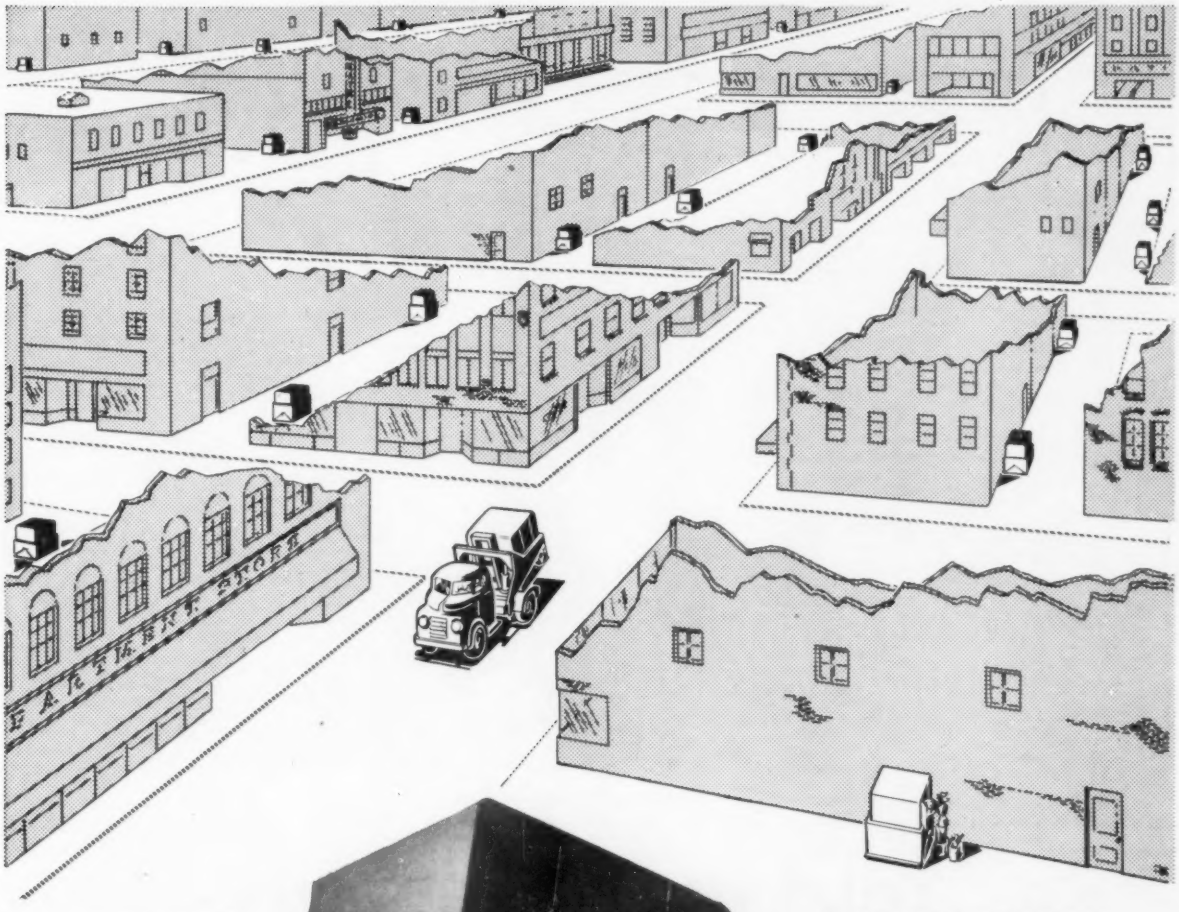
Any city in the country, regardless of size, can expect to eliminate unsanitary rubbish conditions in the commercial areas—and at a tremendous reduction in costs—with the Dempster-Dumpster System. For complete information, contact the manufacturer—Dempster Brothers, Inc.



MONAHANS, TEXAS (population 6,311) is one of the recent cities to install the Dempster-Dumpster System. Typical of the conditions there *before* and *after* this modern system was installed are shown in snapshots below. One Dempster-Dumpster serves 27 containers during four night hours. In the daytime, Dempster-Dumpster with Kolecter Container collects residential refuse (see photo at right). Equipment investment will be amortized in 3 years by the city from actual savings.

There's a Dempster-Dumpster Sanitation Engineer Near You!

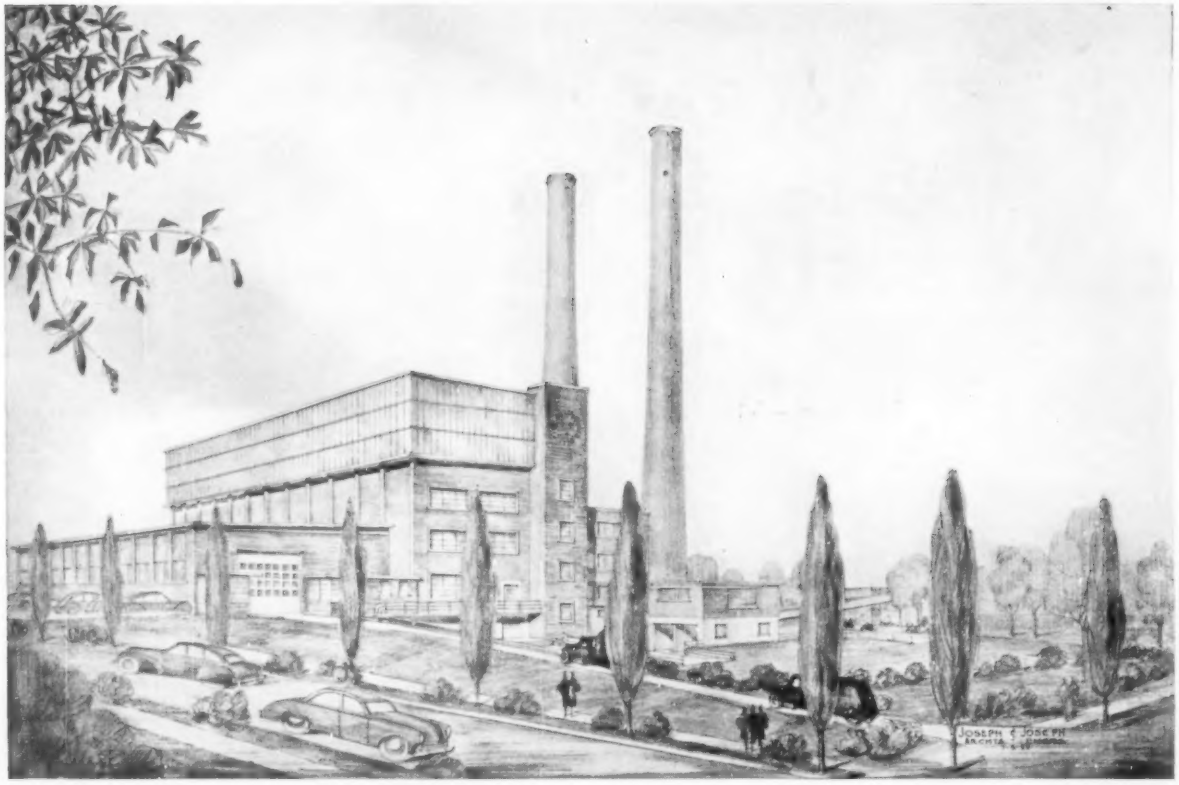
6170



We chopped off the buildings in illustration above to enable you to get an idea how this simple system will function in your downtown business district. You will want other containers at schools, hospitals, apartment and suburban areas, etc., depending on your requirements. Average small city has one Dempster-Dumpster serving from 25 to 50 containers. Larger cities of course require larger installations.

By means of hydraulic controls in cab, each container is quickly picked-up, hauled and dumped as shown here. Only one man, the driver, is required.

DEMPSTER BROTHERS, 937 Dempster Bldg., Knoxville 17, Tennessee



Architect's drawing of the Louisville, Kentucky refuse incineration plant—Joseph and Joseph, Architects. Not illustrated is the new Sewage Treatment Plant, Metcalf and Eddy, Engineers.

LOUISVILLE USES REFUSE TO DISPOSE OF SEWAGE SLUDGE

The City of Louisville, Kentucky is currently building a new sewage treatment plant and—several miles away—a new refuse incinerator plant.

Rather than incorporate sludge disposal facilities in the new treatment plant, the City will truck filter cake to the refuse incinerators. There, two C-E Raymond Flash Drying Systems will utilize the waste heat from the incinerators to dry the filter cake for use as a fertilizer or prepare it for burning in the incinerator with the refuse. For Louisville, this combination of facilities offers a number of advantages. Among them are—

Least First Cost for a system capable of drying, incinerating and deodorizing. The refuse incinerator eliminates the need of a separate drying furnace.

Least Operating Cost because it taps a source of "no cost" BTU's, thereby eliminating the need of purchased fuel.

Maximum Flexibility since the City can dry any amount of sludge for sale as a fertilizer or for use on municipal golf courses, parks and lawns. Any unused sludge can be incinerated with the City's refuse.

If you are considering new sewage disposal facilities—alone or in combination with refuse disposal, see C-E. We will be happy to discuss your needs with you and with your consultants. No obligation of course. Remember, *more filter cake is dried and/or incinerated by the C-E Raymond System than by all other systems combined.*

COMBUSTION ENGINEERING

C-E

B-965

RAYMOND DIVISION
1315 North Branch Street, Chicago 22, Illinois

Eastern Office: 200 Madison Avenue, New York 16, N. Y. • Western Office: 510 West Sixth Street, Los Angeles 14, Cal.

ALSO FLASH DRYING AND INCINERATION SYSTEMS FOR INDUSTRIAL WASTE DISPOSAL

Meet the New
OLIVER OC-46

designed exclusively for loader work

The Jet-Trencher, powered by hydraulic loader system, can be mounted or removed in 90 seconds. This great combination can handle many different jobs.

The new Oliver OC-46 offering 5/8-yd. capacity is available only as a complete loader unit. With wide 46″ gauge track and greater track length, it gives you the extra stability to use full power at all times. You can work steadily at top speed with the heaping bucket loads that pile up production faster.

Here's extra mobility, too, with 4-speed transmission ranging from 1½ to 5¼ m.p.h.—a change of pace to meet every need. Maximum drawbar pull is 4200 lb. You'll find it the easiest operating crawler you've ever known with smooth hydraulic controls, velvety clutching, comfortable box-type operator's seat and modern low silhouette that permits maximum visibility. Its years-ahead design means greater earning power for you.

There's still more cost-cutting news for you in the new OC-46. See it and operate it yourself. Call your Oliver Distributor for a demonstration—today!

THE OLIVER CORPORATION

400 W. Madison Street, Chicago 6, Illinois

a complete line of industrial wheel and crawler tractors and matched allied equipment

FAST, LOW-COST WAY TO INSTALL PIPE . . .

push it under streets, roads, tracks, lawns with a timesaving

GREENLEE HYDRAULIC PUSHER

Speed underground piping jobs this way. GREENLEE Pusher is one-man-operated (by hand or with power pump), portable, simple to set up and use. No tearing up of pavement, floors, lawns . . . does away with extensive ditching, tunneling, backfilling, repaving. GREENLEE Pusher cuts job time to a fraction . . . often pays for itself on first job.

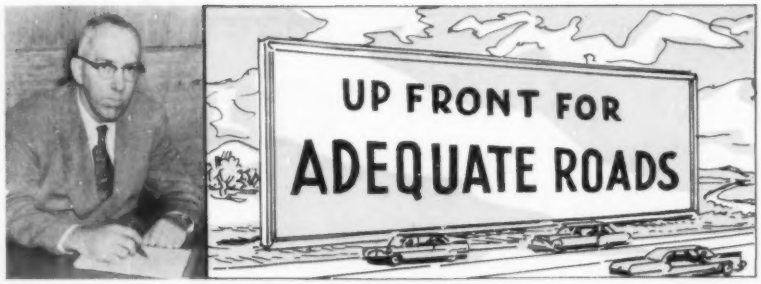
Two feet per minute average pushing time

GREENLEE Pushers are available in two sizes: No. 790 for ¾" to 4" pipe . . . No. 795 for pipe over 4", concrete sewer pipe, large ducts. Average performance of No. 790, shown above with power pump, two feet per minute. Write for literature.

GREENLEE

GREENLEE TOOL CO.

2043 Columbia Avenue • Rockford, Illinois



by LEO J. RITTER, JR.

Highway Consultant

Simply Fabulous — As promised, the ARBA Road Show, held in Chicago the last week of January, was fabulous, simply fabulous. The International Amphitheatre was jammed with nearly 250 exhibits, ranging from small booths to the tremendous areas occupied by the major manufacturers. All told, it was estimated that equipment on display had a retail sales value of about $12 million and weighed about 14,000,000 pounds. There were many interesting and attractive displays—to mention a few of them would probably be unfair to others with equally fine exhibits.

Two things stood out in our mind—the size of some of the equipment on display and the crowds of visitors. There seems to be no end to the increasing size (and complexity) of roadbuilding equipment, particularly the earthmoving and hauling units. You begin to wonder how a mere man can handle and control these monsters—it was interesting to note that many of the units have air-conditioned cabs, wrap-around windshields, hydraulic controls, and other features designed for the comfort of the operator. How many people attended? Official figures are not yet available as this is being written, but our guess would put the total somewhere near 40,000.

We didn't get to attend many of the general and technical sessions of the Convention, which were going on at the same time as the Road Show. However, speeches and papers we did hear were interesting and informative. The popularity of the choice of Bert Tallamy as Federal Highway Administrator was clearly indicated by the tremendous applause he received at the first general session.

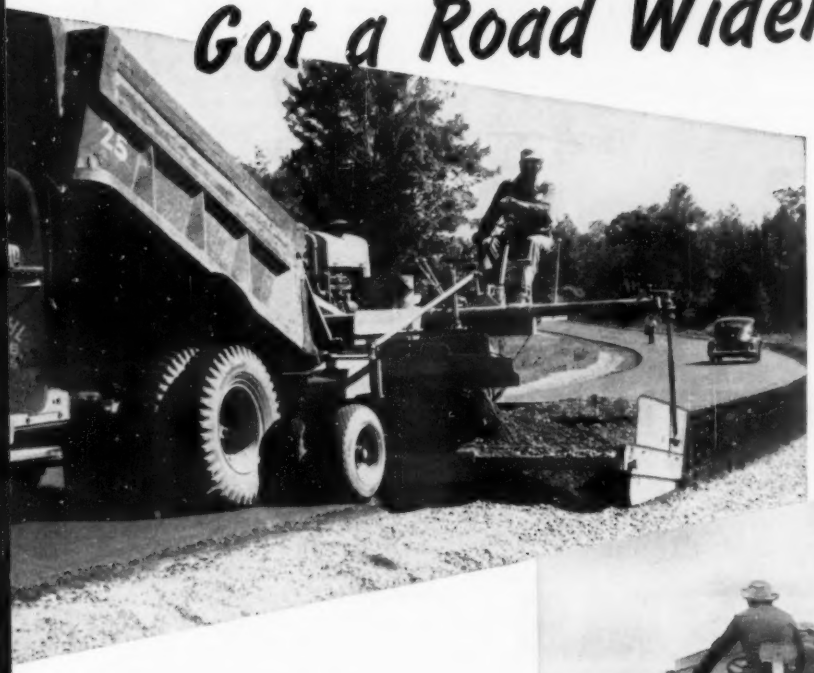
Two other meetings were going on at essentially the same time—the annual convention of the Associated Equipment Distributors and a road seminar held by the International Road Federation. The AED had its own equipment and materials exhibit in the basement of the Conrad Hilton Hotel—with over 100 exhibitors participating. Sessions of the IRF seminar were held at the Drake Hotel; over 3000 foreign officials and engineers from more than 50 countries attended. With all this activity going on, you can imagine the crowds and confusion in the leading hotels—why, even trying to get on an elevator at the Conrad Hilton was worse than any bargain-day rush in Macy's basement.

Anyway, it's all a matter of history now. Was it worthwhile? Undoubtedly yes, although some manufacturers may doubt it when they get back home and start totalling the cost of the exhibits, expense accounts, and entertainment. When will the next one be? Some sources say 4 years, but we rather doubt if there will be another that soon.

Publications — The Bureau of Public Roads has recently issued a 172-page book—*Parking Guide for Cities*—which is available from the Superintendent of Documents at 55 cents per copy. The BPR *Highway Drainage Manual*, in preparation for a number of years, will be available sometime this spring through the Superintendent of Documents—watch for it! The new AASHO Policy on Geometric Design of Urban Facilities is also expected sometime this spring—it's another one to watch for. A book of broad scope is *The Metropolitan Transportation Problem*, by the Brooking Institution, 722 Jackson Place, N. W., Washington 6, D. C. ($4.50). A new edition of the CAA's *Airport Paving* is available from the Superintendent of Documents at $0.40 per copy. And 21 U. S. government publications on surveying, drafting, and mapping are listed in a news release from the Government Printing Office (GPO 1956-0-406196).

Safety Valve — An innovation on U. S. 85 is designed to protect the

Got a Road Widening Job?



Get more mileage per dollar with Blaw-Knox Road Wideners

Pave *concrete* without forms

Pave and finish *asphalt*

Spread any *aggregate* for base material

If you have a road widening job ahead of you, either as a contractor or a state engineer, you will be interested in equipment that will lower equipment investment, reduce labor requirement and give you the most work for the lowest cost. Blaw-Knox Road Wideners are ideal for any road widening or shoulder building program since they spread concrete, asphalt and any aggregate to an accurate line and grade. Hydraulic controls permit gradual widening of strip around curves when laying aggregate or asphalt. Vibrator attachments are available for any model to spread and finish concrete without forms. Large hopper, special conveyor belt and hydraulically controlled strike-off gate handle all types of material at a steady high capacity of up to 200 tons per hour. Tandem drive wheels on all models provide power to spare for pushing even the heaviest trucks up steep grades.

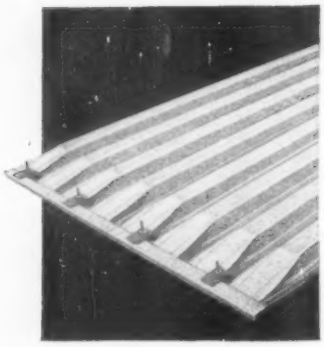
Blaw-Knox Dual Compression Trench Rollers are flexible and economical compactors for road widening jobs, too. They will roll widths from 20" to 39" and to depths of 24".

Your Blaw-Knox distributor can give you complete details on three models of Road Wideners and the Trench Roller.

BLAW-KNOX

BLAW-KNOX COMPANY
CONSTRUCTION EQUIPMENT DIVISION
43 CHARLESTON AVE., MATTOON, ILLINOIS

STEEL FORMS



for concrete bridge decking

U.S.F. Steel Forms are custom fabricated for exact fit to bridge structurals. More than required strength is provided to support the wet concrete. They install rapidly with common hand tools from *top side*, eliminating need for wood form construction, shoring, and safety nets. Permanently left-in-place, they eliminate costly stripping operations. Permits painting below-the-deck steel before pouring concrete. Speed up schedules—save time and labor—avoid penalties with the most practical method of deck form construction yet developed—U.S.F. Leave-In-Place Steel Forms.

Illustrated data sheet available on request

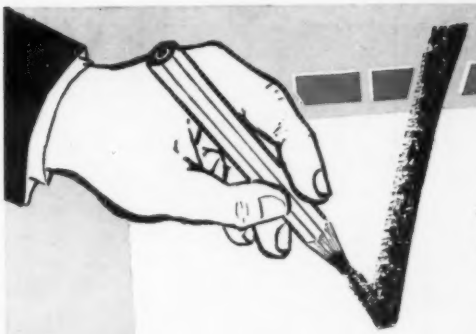
UNITED STEEL FABRICATORS, INC.
WOOSTER, OHIO
USF
PRODUCTS
Hollow Metal Doors • Prefabricated Metal Buildings • Window Wells • Highway Guard Rail • Bridge Flooring • Steel Forms for Concrete Bridge Floors • Corrugated Metal Pipe • Sectional Plate Pipe and Pipe Arches
USS STEEL

city of Raton, New Mexico from runaway trucks. After leaving Raton Pass, this highway descends at a 6 percent grade into the main street of Raton. The New Mexico Highway Department now has led a tangent off one of the curves in the descent; the tangent is about 1000 feet long and has a 30 percent up grade. The "safety valve" is located about 1000 feet above the bottom of the long downward grade, is marked for "Runaway Trucks Only", and is protected by a light wooden fence from encroachment by the ordinary motorist. Good idea, don't you think?

Aggregate Blending — The December issue of *Crushed Stone Journal* carries a brief, but very informative, article by James Rice of the NCSA staff on graphical methods of combining two or three aggregates to produce an aggregate which will meet specified grading requirements. A step-by-step explanation of a graphical method for determining the proportions of three aggregates is given.

Speed-Delay Studies — An interesting account of a simplified method of making speed-and-delay traffic studies on urban traffic routes is contained in the January issue of *Highway Research Abstracts*. Reported by Fred Hawley of the Bureau of Public Roads, the method involves the use of a conventional dictating machine for recording data observed during speed-and-delay runs. Advantages of the method include the following: (1) only one man is required for the operation, hence the cost is reduced; (2) no special equipment is needed, and the dictating machine can be immediately converted to ordinary office use; (3) miscellaneous delays at random locations can be recorded without difficulty; and (4) the data can be plotted directly from the voice recording to the speed-and-delay chart, thus precluding any transcribing.

From Here and There — The AGC has predicted that 1957 will be another record-breaking construction year—with predicted expenditures in the neighborhood of $64 billion. The Georgia Highway Department has moved into its new headquarters building on Capitol Square in Atlanta. By the time you read this, Al Church will be the new State Highway Engineer of Florida. Arch Carter, former manager of the Highway Contractors' Division of the AGC, has resigned to form the



For SAFETY, DIRECTION and PARKING

Your Check Sheet for AIDS to BEST TRAFFIC CONTROL

NEFSLABS®

TRAFFIC MARKERS STRIPS ARROWS

☐ Toughest, flexible plastic. ☐ Reflective and non-reflective.
☐ Resist abrasion and tearing. ☐ Repel water, oils, salt.
☐ 5 brilliant, durable colors. ☐ 4 different shapes – also strip.
☐ 15 sizes and 2 thicknesses. ☐ Bevelled edges.

NEFMATS*

NEW DELUXE TRAFFIC LETTERS

☐ One piece, roll-down letter mats. ☐ Same "Traffic-Tested" plastic as NEFSLABS. ☐ 6 high contrast color-code combinations. ☐ Letters 1 to 10 feet high. ☐ No cutting, piecing or fitting.

*TRADE MARK APPLIED FOR

STOP

★ **NEFSLABS** and **NEFMATS** give you the most **complete** line of plastic markings, letters, numerals and arrows. ★ The very **highest** quality and **longest** life of any traffic marking materials mean **year-after-year** safety and savings for all uses. ★ These aids to modern traffic control go down in **minutes** and stay down for **years** with special formula **NEFGLU.** ★ **Proven** best by traffic test!

Write now for colorful NEFSLABS and NEFMATS literature

NEFGLU®

ADHESIVE

☐ Cold, quick drying. ☐ Strongest all - weather bonding. ☐ Light, neutral color. ☐ Easily applied by brush or pressure spray. ☐ No pegging or grouting.

New Sales Territories are Open for Capable Representatives.

J. W. NEFF

LABORATORIES, INC.

TRAFFIC MARKINGS DIVISION

STOCKERTOWN 9, PA.

WARN *LOCK-O-MATIC* **HUBS**

APPROVED "Jeep" EQUIPMENT

Automatically "idle" the front drive in 2-wheel drive

Patented

SAVE GEARS, TIRES, GAS!

Warn Hubs make your 4-wheel drive more useful than ever, because they make it into a "free-wheeling" 2-wheel drive, as well as a 4-wheel drive! Use it either way—automatically—*as you shift!* With Warn Lock-O-matics it *always* free-wheels in 2 w.d., always engages in 4 w.d., forward or reverse, *as you shift.* You automatically reduce front end wear, engine load, tire wear in 2 w.d.—there is no drag, gear whine, shimmy. Ask your 4-wheel drive dealer for a free demonstration of Warn Lock-O-matic or Locking (manual) Hubs today, or write. Models for all 4-wheel drives to 1½ tons.

WARN SELECTIVE DRIVE HUBS

WARN MFG. CO., Riverton Box 6064-P3, Seattle 88, Wash.

"DIGS MORE DIRT FOR LESS MONEY THAN ANY OTHER DITCHING MACHINE"*

***Says Roland Kniepkamp of Mascoutah, Ill.** "I am now using my third 524T Pow-R-Ditcher. I don't believe there is another machine that will dig as much dirt for the money invested. My trenching business has increased and I have taken a lot of work away from competitive machines. For satisfied customers and economical trenching you can't beat the "Pow-R-Ditcher." . . . and its easy to transport on the Vermeer "Tip-Top" tandem wheel trailer.

WRITE FOR COMPLETE INFORMATION AND NAME OF DEALER

Model 524T digs 8" to 24" wide at speeds of 1' to 15' per minute. Self propelled, rugged, highly manueverable. Excellent for foundation footings, gas, water and sewage lines. Easy to transport. "The BIG ditcher with the low price." Smaller models available.

Some Excellent Sales Territory Available

VERMEER MANUFACTURING CO. PELLA, IOWA

firm of Lindsey, Carter and Associates, consulting engineers and land surveyors, Excelsior, Minnesota. Nine states have already programmed all of their share of federal funds for the interstate system for fiscal 1957; at least one state has already programmed a sizeable percentage of fiscal 1958 funds. W. A. Bugge, director of highways for the Washington State Highway Commission, is the new president of AASHO. Charles Noble, former Chief Engineer of the New Jersey Turnpike, has been named Director of Highways for the State of Ohio.

Swan Song — With regret, your writer must note that this will be his last column for *Public Works.* Yes, that's right—we've switched jobs again, this time to an assignment which makes it impossible to continue our pleasant association with the wonderful folks here at *Public Works.* We have thoroughly enjoyed doing this column—and hope that you readers have enjoyed it, too. We know some of you have, since you have been kind enough to tell us so. Thanks to all of you, and we'll be seeing you around.

(Editor's note: We are sorry, too, and shall miss this interesting and educational column. We wish Jack the best of luck in his new field of work).

• • •

Seismic Subsurface Investigations in the Highway Program

Seismic subsurface investigation, a relatively new technique, is an electronic—acoustic method of detecting and plotting in continuous profile various subsurface materials, including bedrock. The number of borings required is greatly reduced. A light explosive charge causes shock waves which are picked up by geophones and transmitted to a seismograph. This records the time interval of arrival of each shock wave at each geophone. Since the overburden bears a mathematical relationship to the times of wave arrival, the depth to bedrock can be determined. According to Lockwood, Kessler and Bartlett, the necessary crew and all equipment can be carried in one station wagon.

• • •

5,000 Septic Tanks Per Year

During the past four years, 20,000 new septic tank installations have been made in the Seattle, Wash., metropolitan area, according to the city-county health department.

Transportation. Over the roughest terrain, through sand, soft earth or mud, in good weather or bad, the Universal 'Jeep'†, with the extra traction of its 4-wheel drive, takes supervisory personnel, work crews, tools, equipment and supplies wherever they are needed. It shifts easily into conventional 2-wheel drive for quick highway travel between jobs.

Ten billion miles of proof!*

One of the reasons why so many 'Jeep' vehicles are used in public service

All-New Forward Control 'Jeep' FC-150 Truck. It's the first time a 4-wheel drive truck has so effectively combined so much cargo capacity (74 inch pickup box), with such exceptional "go-anywhere" maneuverability (81 inch wheelbase).

Mobile power. The Universal 'Jeep', with power take-off or hydraulic lift, takes power right to the job to operate this trencher and many other types of equipment including winches, grader blades and sprayers or dusters.

Maintenance. The 4-Wheel-Drive 'Jeep' Utility Wagon carries up to 110 cubic feet of bulky cargo, or six passengers. It takes supervisors, workers and tools to maintenance operations other vehicles can't reach.

It's easy to see why economy-minded officials everywhere are turning to 4-Wheel-Drive 'Jeep' vehicles for public works and public service operations. They are the only 4-wheel drive vehicles in their weight class that are time-tested and performance-proved in more than 10 billion miles* of on-the-job transport service. Their "go-anywhere" dependability provides extra insurance in daily public service use and in emergencies.

Only Willys has so many years of experience in engineering 4-wheel drive vehicles in the under 6000 GVW weight class. 'Jeep' vehicles help stretch tax dollars through their long life, low upkeep and high resale value. Ask your Willys dealer for an on-the-job demonstration, or write for information.

The 'Jeep'® family of 4-Wheel-Drive vehicles

WILLYS...makers of the world's most useful vehicles

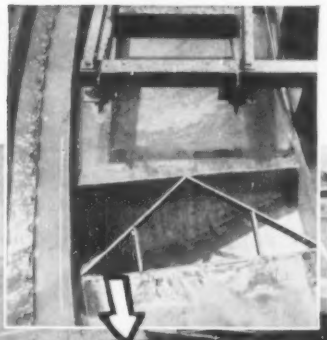
WILLYS MOTORS, INC., TOLEDO 1, OHIO

*An understated estimate of the miles of transport service driven by 'Jeep' family vehicles. Some estimates place the mileage at more than *fifty* billion.

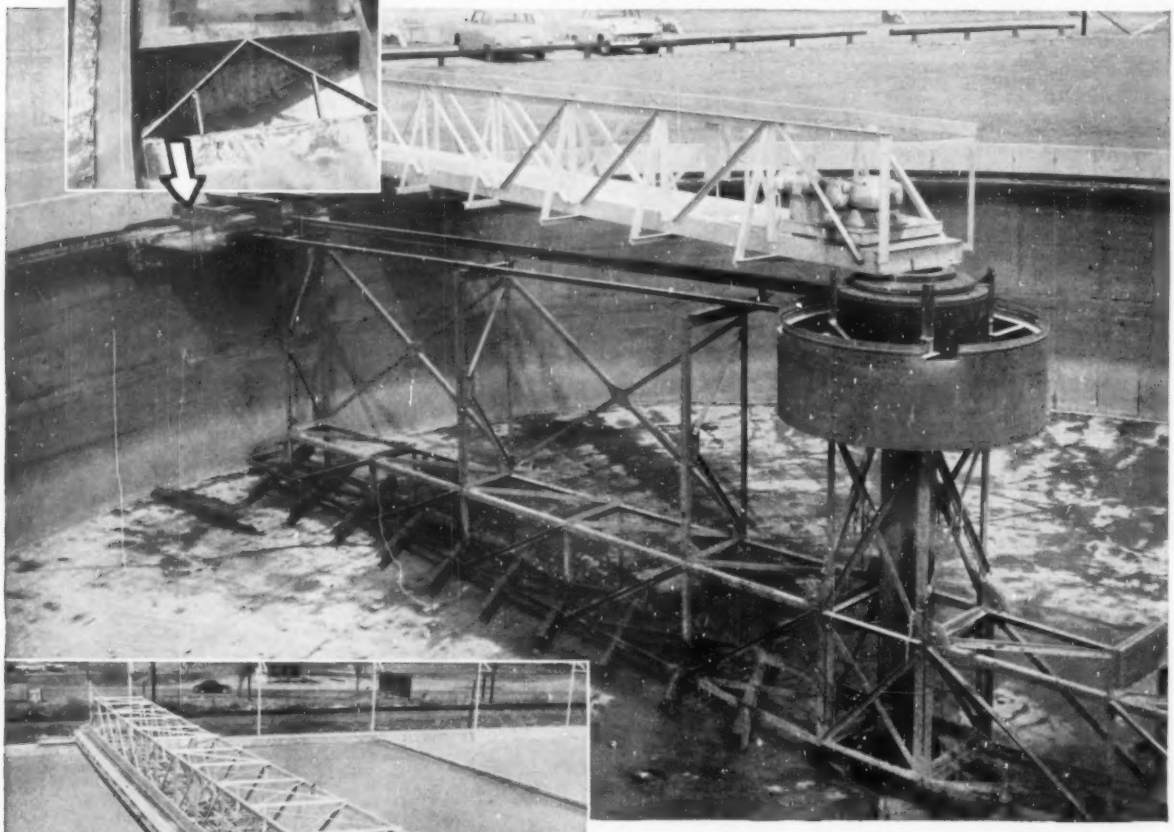
†Model CJ-5 shown.

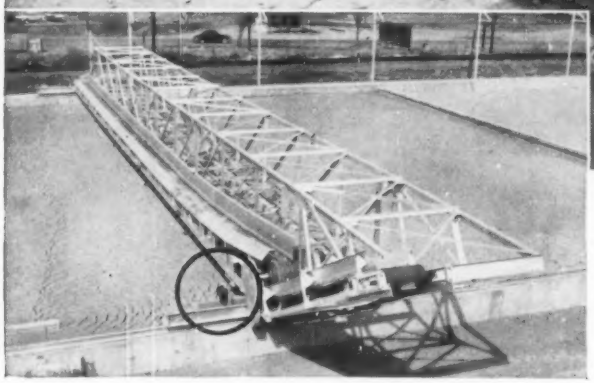
LINK-BELT equipment helps bring Manhattan, Kansas

low-cost sewage treatment



70-FT. LINK-BELT CIRCULINE Sludge Collector is fed raw sewage from bottom of tank. Specified by Wilson & Co., consultants, system features a superior automatic scum skimmer with rotating collection blade. Scum is worked into pocket by rotation. Passage of hinged blade on rotating arm (inset) deposits scum in box, eliminating all manual handling.





TRAVELING BELT CONVEYOR conveys dry sludge from 10 drying beds to trucks, thus reducing manual handling of sludge to a minimum. Push-button control station (circled) permits operator to move bridge automatically as removal progresses.

Circuline sludge collectors with automatic scum skimmers and traveling belt conveyor mechanize sludge collection and disposal

Like so many municipalities and industrial plants, the city of Manhattan uses Link-Belt Circuline Collectors for quick, low-cost sludge and scum removal. This integrated system incorporates a traveling belt conveyor and automatic scum skimmers—provides efficient, positive sludge removal . . . minimizes manual handling.

Link-Belt can apply a complete line of sanitary engineering equipment and extensive experience to your water, sewage or industrial waste treatment problems . . . will gladly work with your chemists and consultants. Call your nearby Link-Belt office.

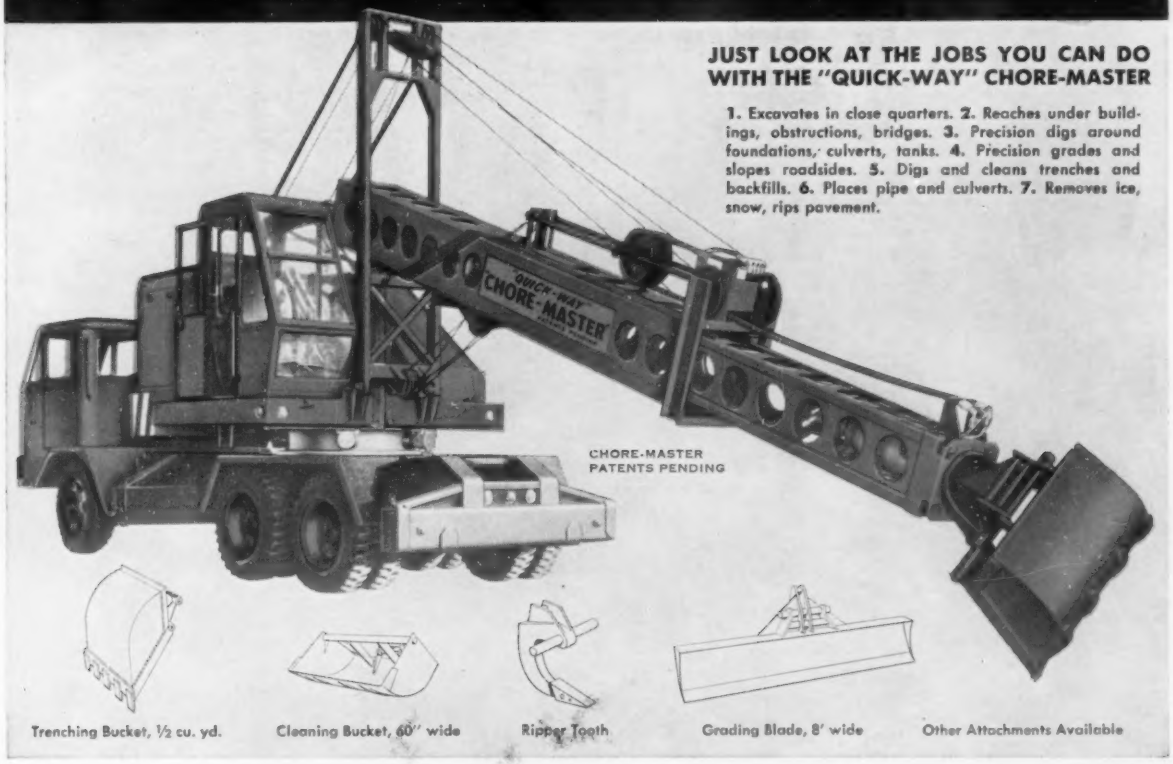
LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,409

For the first time . . . an all-purpose hydraulic attachment for crane shovels!

The new "QUICK-WAY" CHORE-MASTER!



JUST LOOK AT THE JOBS YOU CAN DO WITH THE "QUICK-WAY" CHORE-MASTER

1. Excavates in close quarters. **2.** Reaches under buildings, obstructions, bridges. **3.** Precision digs around foundations, culverts, tanks. **4.** Precision grades and slopes roadsides. **5.** Digs and cleans trenches and backfills. **6.** Places pipe and culverts. **7.** Removes ice, snow, rips pavement.

The new "QUICK-WAY" Chore-Master is the first interchangeable hydraulic grading-digging attachment that makes dozens of jobs possible with one attachment. Now with the new Chore-Master, five crane shovel models, and the most complete standard line of attachments, "QUICK-WAY" is the most versatile machine you can own.

Two large hydraulic cylinders and one hydraulic motor operate the reaching, digging and swivel action of the boom and bucket. A single control lever guides all these actions with a simple twist of the wrist for sure, precision, hydraulic control.

This new attachment can be changed quickly to any of the other "QUICK-WAY" standard attachments.

Now a "QUICK-WAY" is the most versatile machine you can own—with MORE ATTACHMENTS to handle MORE JOBS with greater profits:

CHORE-MASTER • PILE DRIVER • DRAGLINE
CLAMSHELL • CRANE • MAGNET
TRENCH HOE • SHOVEL

MANY OTHER SPECIAL TOOLS ARE AVAILABLE

NOW! 5 "QUICK-WAY" MODELS WITH MORE BIG SHOVEL FEATURES:

125A—6/10 yd.—12½ Ton **105A**—5/10 yd.—10½ Ton
85A—4/10 yd.—8½ Ton

85AC Crawler **105AC** Crawler

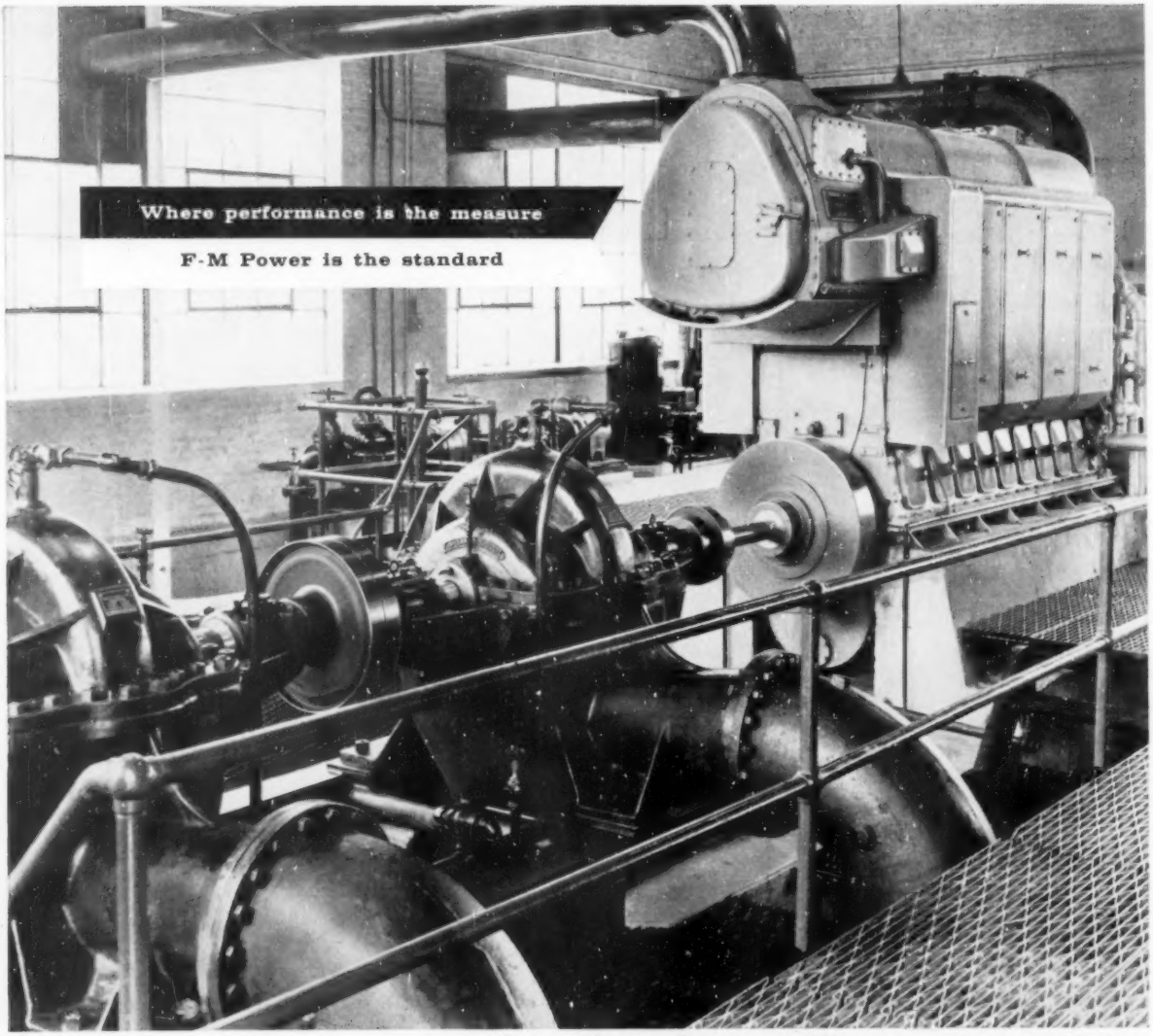
"QUICK-WAY" TRUCK SHOVEL CO.
A Thew Shovel Subsidiary Denver, Colo.

"QUICK-WAY" TRUCK SHOVEL CO. Dept. 297
2401 East 40th Ave.,
Denver 5, Colorado, U.S.A.

Please send me the following "QUICK-WAY" catalog:

☐ Chore-Master ☐ 125A
☐ 85A ☐ 85AC Crawler
☐ 105A ☐ 105AC Crawler

Name.....
Title.....
Company.....
Address.....
City and State.....



Latest addition to Greensboro's F-M power-pumping team which includes two 14", three 20" and one 16" single-stage, double-suction, centrifugal pumps. All are driven by O-P diesels totaling 3175 hp.

Greensboro Saves $46,300 Yearly with Fairbanks-Morse Power-Pumping Team

Increased capacity at operating costs that are lower by 55%—that is the record set by 3100 hp. of Opposed-Piston diesels and the six F-M pumps they drive in the water system of Greensboro.

Such a "required standard" of performance has been set by F-M diesel and dual fuel engines in all classes of municipal service the country over. Apply the measure of performance to your power requirements and see what the F-M standard of dramatic economies in operating costs can save you.

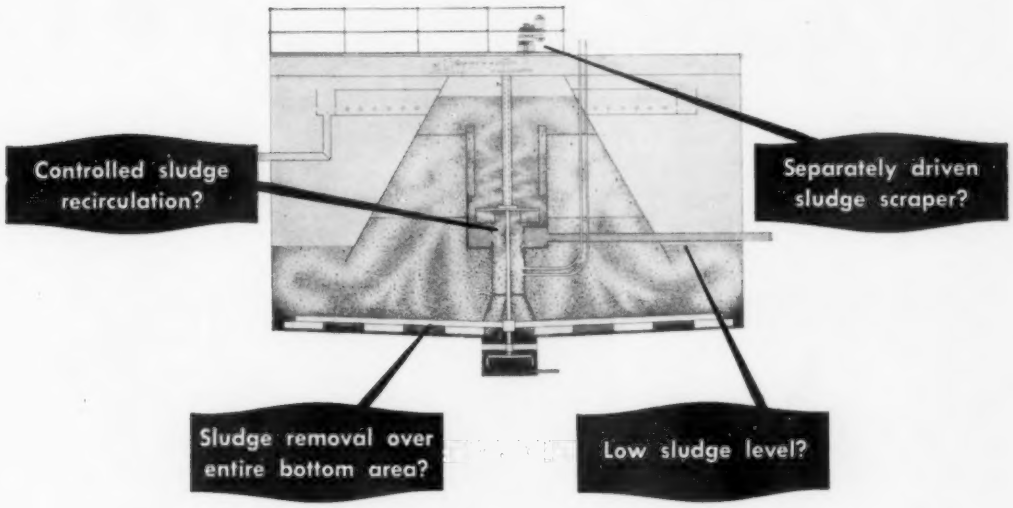
Fairbanks, Morse & Co., Department PW-3, Chicago 5, Illinois.

FAIRBANKS-MORSE
a name worth remembering when you want the BEST

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

WHICH FEATURES...

ASSURE THE CLEAREST WATER?


Controlled sludge recirculation?
Separately driven sludge scraper?
Sludge removal over entire bottom area?
Low sludge level?

They <u>all</u> help to produce clear water. But only when all four features are combined in a single unit can you be sure of a dependable and economical supply of clear water at all times. The GRAVER REACTIVATOR®, a cold process softener and clarifier, is designed to combine <u>all</u> these features. Forty-five years of water conditioning experience have gone into this design — a design that has a proven, successful performance record in hundreds of installations.

WRITE FOR DESCRIPTIVE CATALOGUE WC-103A

GRAVER

Municipal Department: M-112

GRAVER WATER CONDITIONING CO.

A Division of Graver Tank & Mfg. Co., Inc.

216 West 14th Street, New York 11, N. Y.

How HAPCO Aluminum Poles are paying off for the city of Olympia

When the citizens of Olympia, Washington, authorized a street lighting modernization program, Aluminum standards were recommended as the best answer tc the city's particular needs. Located on Puget Sound, Olympia has a saline atmosphere, with a high sulfur content created by nearby timber products manufacturing operations. This presented a special corrosion problem which was reflected in upkeep costs of street lighting equipment. Previously, poles in this location required painting every two years. With HAPCO Aluminum Alloy Standards, no initial or maintenance painting will be needed.

Installation too, brought additional benefits to the city. Light weight HAPCO poles were assembled and wired by two men at a central location. A three man crew using a light duty boom handled the erection. During the progress of the job, part of the electrical distribution system was changed from underground to overhead without any design alterations to the poles. 115-volt festoon outlets were added on the job without difficulty. And, the installers report that pole adaptations to accommodate traffic control equipment, highway markers and other special equipment were made without special tools by mechanics of average skill.

Immediate and long range results like these have prompted cities all over America to specify HAPCO Aluminum Standards and Brackets for all types of lighting jobs. HAPCO poles are lighter, last longer, and fabricated to install with ease. Get the full story by asking for a copy of catalog HAL 754.

HUBBARD ALUMINUM PRODUCTS COMPANY
Division of Hubbard and Company
Pittsburgh 1, Pa.

Ottawa Hydra-Hammer Compacts Backfill At Savings Up To $15.00 Per Hour

You get this tremendous savings when you use the Ottawa Hydra-Hammer because the Hydra-Hammer eliminates a series of costly backfill operations required when the material is replaced by the old method of 6 to 8 INCH layers, which is necessary with most other tamping equipment. The Ottawa Hydra-Hammer tamps backfill material to 100% compaction in 4 to 6 FOOT lifts. The One-Trol Hydraulic System, one of the many exclusive patented features of the Hydra-Hammer, gives you increased production, because only one lever is used to control the rise and fall of the hammer as well as the side to side movement of the hammer and compaction head. This four foot traversing action is also an exclusive feature found only in the Ottawa Hydra-Hammer.

The Ottawa Hydra-Hammer is also an excellent tool for breaking concrete and cutting asphalt in trench openings as well as pavement demolition for highway maintenance. For more information about how to save time and money with the Ottawa Hydra-Hammer, write to Ottawa Steel Division, L. A. Young Spring & Wire Corp., Ottawa, Kansas.

Ottawa Hydra-Hammer Speeds Kansas City Highway Project!

Using the Ottawa Hydra-Hammer, the Kansas City Power and Light Company of Kansas City, Missouri, installs underground power lines for the street lighting system on the new highway between the Broadway Bridge and Highway 71 North in Kansas City, Mo.

ANOTHER LAYCO PRODUCT

Ottawa

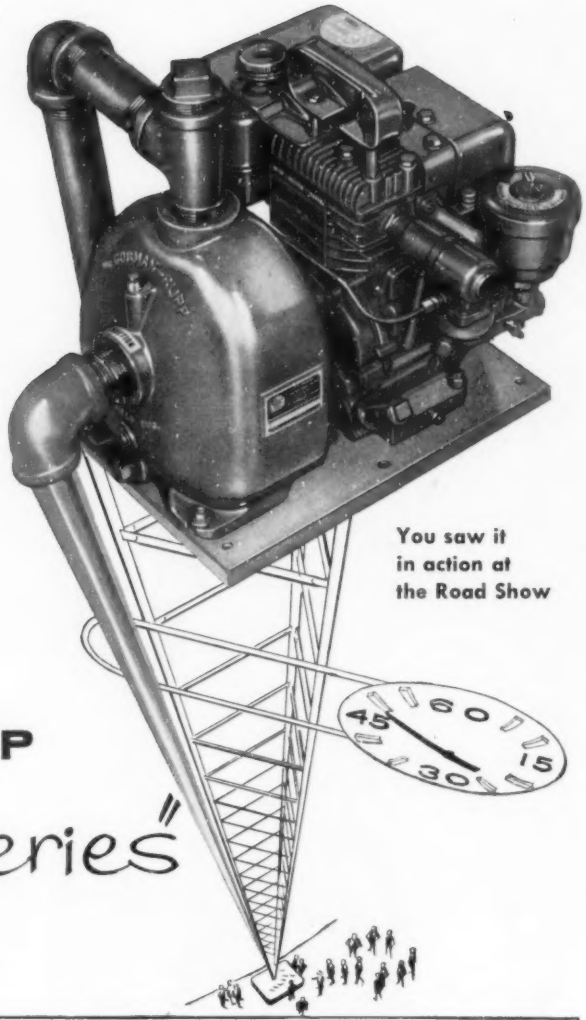
OTTAWA STEEL DIVISION
L. A. YOUNG SPRING & WIRE CORPORATION
OTTAWA, KANSAS

NOW!

Freedom from pumping failure!

SELF-PRIMING

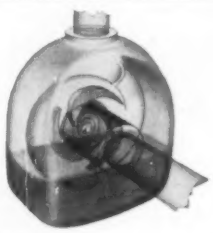
Important announcement to pump users! Here is a pump that never fails, never quits. Solids do not foul this pump. This new Gorman-Rupp design has *straight-in* suction. Pumped liquid enters direct to the eye of the impeller—increased capacity, higher efficiency, higher lift. Simpler. Fewer parts. Now available in sizes 1½", 2" and 3".



You saw it in action at the Road Show

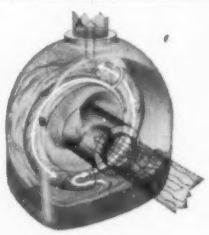
GORMAN-RUPP

New "80 Series" Pumps



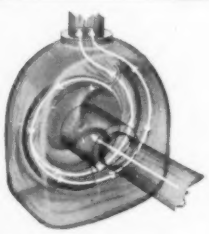
PUMP AT REST

Captured liquid retained for priming. Note the absence of the usual check valve.



PRIMING ACTION

Entrained air (B) escapes at (A) to be discharged. Priming liquid returns (C) to entrain more air.



PUMPING ACTION

Straight-in suction voids entrance restrictions. Water enters direct to eye of impeller.

CHECK THESE NEW-DESIGN FEATURES!

- Straight-in suction
- No check valve
- Lighter in weight
- Long-life mechanical shaft seal

Engine or motor driven. Base or wheel mounts.

THE GORMAN-RUPP COMPANY

305 Bowman Street • Mansfield, Ohio

NEW
K&M Asbestos-Cement SEWER PIPE
with "Fluid-Tite" Coupling

THE EXCLUSIVE
K & M "FLUID-TITE" COUPLING
which eliminates infiltration
at the joint.

TWO SIMPLE STEPS
FOR PERMANENT, WATERTIGHT JOINTS.
ONE . . . lubricate rubber rings.
TWO . . . Slide pipe in. That's all!

It's made of mineral asbestos fibers and portland cement. NON-CORRODING, NON-ELECTROLYTIC, STRONG, LIGHT IN WEIGHT, EXCEPTIONALLY SMOOTH BORE.

These proven factors mean 3-way savings to your community:

YOU SAVE IN PLANNING . . . Flatter grades
Fewer lift stations
Higher-level filtration plants
Smaller pipe diameters

YOU SAVE IN INSTALLATION . . . No stopping for unfavorable weather or ground conditions
Fewer workers, quicker installation
Unskilled labor—no heavy machinery required
Economical transportation and handling
Permanent watertight joints—immediately, simply

YOU SAVE IN OPERATION . . . Infiltration eliminated through the joint
Roots can't enter
Bore remains smooth
Fewer inspections . . . fewer periodic cleanings

Write for complete information on K&M Asbestos-Cement Sewer Pipe.

K&M best in asbestos

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

in Swimming Pools it costs no more for the very best Protection!

Josam SWIMMING POOL EQUIPMENT for WATER LEVEL DECK POOLS

The Water Level Deck Type Pool is a more sanitary, safer and more usable pool for all age groups, in addition to being a more economical pool.

The deck level construction permits filling the pool to a level where the bather can roll out of the water to the promenade deck, at any point, in the easy "turtle type" method, without depending on ladders, steps, ramps or other means. This method makes the Water Level Deck Type Pool very advantageous for the instruction of children, paraplegics and other handicapped bathers.

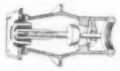
Scum is washed over the coping and out of the pool to accessible drains. The water level which is 1" below the top of the coping, eliminates hard-to-drain scum gutters above the water line and also effects a saving of cost for formed tile gutters and from 5" to 10" of excavation and concrete walls.

Send coupon below for Manual SP-6, the "authority" on swimming pool circulation and drainage. In it you will find typical plans and layouts of pools, with complete descriptions of supply fittings, gutter drains, overflows, outlets, vacuum connections, hair and sediment interceptors and other necessary fittings to meet every pool requirement.

Series No. 0291-B Deck Trench grate

Series No. 0297-B Skimmer grill and access gate

Series No. 0298 Skimmer Fittings with flow control



Series No. 0730-B Balanceze Supply Fitting

Series No. 0380 Main outlet drain

Series No. 0770-B Vacuum Fitting

JOSAM MANUFACTURING CO.
General Offices and Manufacturing Division
Michigan City, Indiana

JOSAM MANUFACTURING COMPANY
Dept. PW-3, Michigan City, Indiana

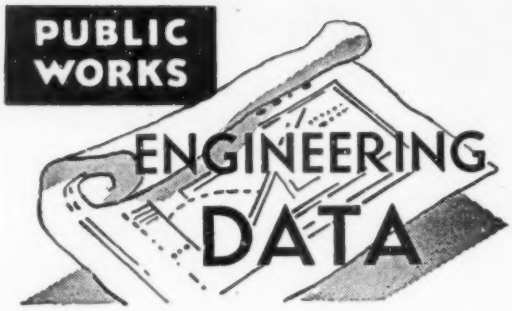
Please send free copy of Manual SP-6

Name.....

Firm.....

Address.....

City.....Zone.....State.....



Water Use Data and Pumping Costs from Pasadena

The excellent annual report of the Pasadena, Calif., Water Dept., for the year ending June 30, 1956, reports water consumption at the average rate of 181.4 gals. per person per day, compared to 177.9 gpcd for the previous year and 119.5 gpcd for 1942. This represents an increase of 2.0 percent over the preceding year and 51.8 percent over 1942.

The cost of pumping water from deep wells averaged 4.71 cents per 1000 cu. ft., per 100 ft. head, based on a pumpage of 410 million gallons against an average head of 357 ft. Booster pumping averaged 7.47 cents per 1000 cu. ft. per 100 ft. head.

Average daily consumption was 3,424,000 cu. ft. Maximum day consumption occurred in September and reached 7,587,400 cu. ft.

Water Usage in Milwaukee

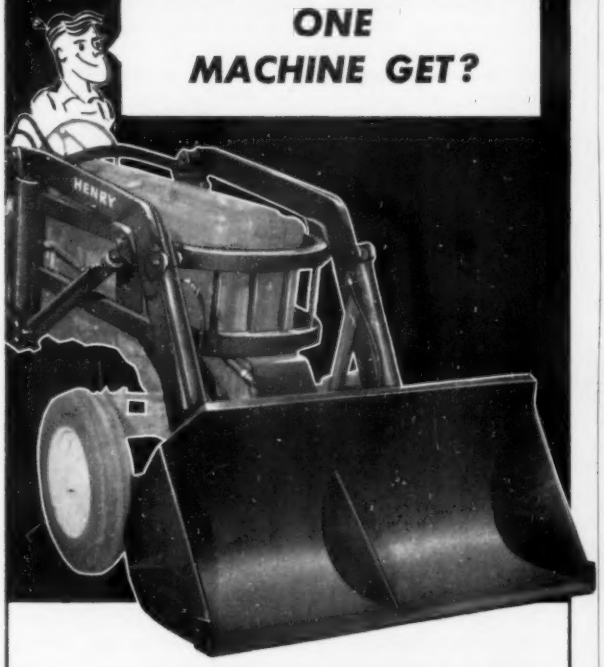
The total water pumpage in Milwaukee in 1955 was 51,800,000,000 gallons, an increase of 3,600,000,000 gallons over the previous year. The average daily consumption was 141,917,808 gallons. Based on an estimated total population supplied of 797,200, of which 681,000 reside in the city and 116,200 outside of the city, the average daily per capita consumption was 178 gallons.

The highest pumpage for any one day in 1955 was on August 16th, when a pumpage of 251,483,000 gallons established a new record. The maximum hourly rate of pumpage or "peak" occurred on August 16th at 10:00 a.m. and was at the rate of 315,600,000 gallons per 24 hours. The maximum hourly rate of consumption was on August 18th at 6:45 p.m. at the rate of 360,200,000 gallons per 24 hours. The maximum 24 hour consumption of water was 242,822,000 gallons and occurred on August 15th. The difference between consumption and pumpage is accounted for by the lowering of the water in the reservoir, the elevated storage tanks, and the ground storage tanks at the Menomonee valley booster station. The previous all-time pumping record for 24 hours, on July 27, 1954, was 223,030,000 gallons.

Sedimentation of Sewage and Supernatant Treatment Studied

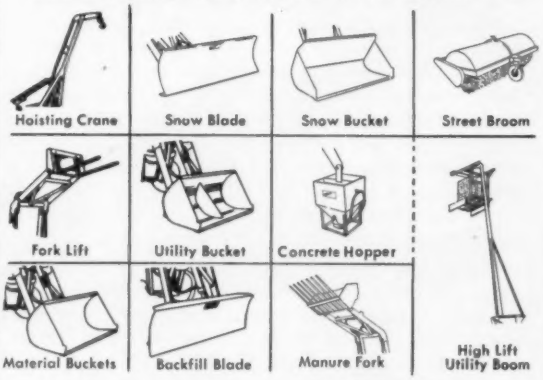
Research in progress by the Texas Engineering Experiment Station contemplates possible modifications in sewage sedimentation tank design and the use of trickling filters for treatment of sludge digester supernatant liquor. In considering the size, shape, and type of tank and the effects of specific variables, a small transparent model and a pilot plant unit are

HOW USEFUL CAN ONE MACHINE GET?



THE HENRY INDUSTRIAL TRACTOR SHOVEL brings solid-steel lift arms and powerful cylinders into action on every loading-leveling job. Hoists 2000 lbs.—will bulldoze anything your tractor can budge. Ten attachments available to adapt the Henry perfectly to your needs.

Custom-Built, Work-Tested Attachments . . .



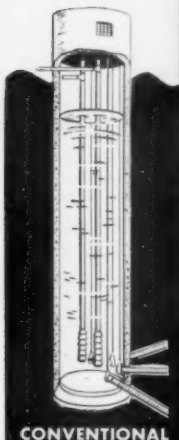
By the makers of the world-famous Henry Hydraulic Backhoe
See your nearest Henry dealer or write today for free booklet.

HENRY HYDRAULIC *all-purpose* EARTH MOVERS
MANUFACTURING COMPANY, INC.
1700 North Clay St. Topeka, Kansas
"You can do it BETTER with a HENRY!"
NATIONWIDE SALES and SERVICE

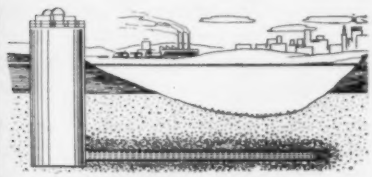
RANNEY

ASSURES YOUR WATER SUPPLY

Already proven around the world as the collector that yields more naturally filtered water, with less equipment, less personnel, and fewer pumps than any other conventional system.

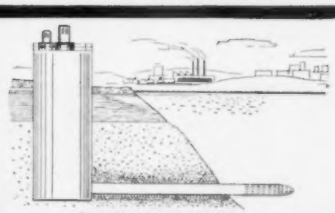


CONVENTIONAL COLLECTOR



INFILTRATION GALLERY

RANNEY VERTUBE



RANNEY INTAKE

A Few Industries Using Ranney

Granite City Steel Co.
U. S. Steel Corp.
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Shell Oil Co.
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Cities:
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Grand Haven, Mich.
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THE RANNEY INFILTRATION GALLERY provides low cost water supply to industry and community. The gallery provides large quantities of clear non-turbid water in a revolutionary yet economical way, and it requires no maintenance.

RANNEY VERTUBE. A natural gravel vertical water well at low cost, developed exclusively for low volume users. Engineered with the same precision and efficiency that has made Ranney a *must* for communities.

THE RANNEY INTAKE designed to provide surface water efficiently and economically. These structures can usually fit into the design of your engineering department or consultant.

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ASPLUNDH CHIPPERS can cut your hauling costs as much as 75%; will completely eliminate brush burning, and provide a valuable and useful by-product.

Here's how you benefit —

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Only ASPLUNDH CHIPPERS have been engineered, developed and *proven* by the largest tree company in the world. *They are safer, faster, more economical to operate than any other chipper made.*

WRITE TODAY FOR COMPLETE INFORMATION. BETTER STILL— ASK FOR A NO-OBLIGATION DEMONSTRATION.

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☐ Send me FREE FOLDER: *The Modern Approach to the Brush Problem.*

☐ Arrange a demonstration without obligation.

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BY ACTUAL TEST THE FASTEST CHIPPER MADE

being used. Model studies have been used to develop efficient inlet and outlet structures. The structures developed have been proved in the pilot plant tank.

The pilot plant tank is a concrete structure, unique in that any dimension can be varied independently of the others. Thus, a series of tests is made, changing one and only one variable at a time. Upon completion of a group of series, the data are subjected to statistical analysis, and the effect of each variable is demonstrated in an empirical equation. Up to the present time, chief emphasis has been placed on depth of tank. An equation has been developed showing the relation between depth and tank efficiency. To evaluate the ability of trickling filters in the treatment of supernatant liquors, a group of filters are being varyingly dosed. Data are being collected on possible loadings and efficacy of the treatment. The researchers on both projects are J. H. Sorrels and P. J. A. Zeller.

Striping and Signing Wyoming Highways Uses Much Material

The adequate marking of paved mileage on Wyoming highways requires approximately 32,000 gallons of yellow paint and 75,000 pounds of glass beads annually for about 4,500 miles of highway. Present methods employed by the striping crews call for the application of reflector beads after the marking paint is sprayed on the pavement surface and before the paint is dry. This system affords greater night visibility than could be obtained by the former method of mixing paint and beads in the paint tanks.

Two experimental sections of right shoulder guide lines have been painted, between Rock Springs and Green River, and between Torrington and Lingle. A close check of accidents on these sections will be made to determine the effectiveness of this type of striping.

Continual vigilance is required in maintaining approximately 35,000 signs along Wyoming highways to regulate, guide and warn drivers. Replacements and new installations made it necessary to purchase about 20,000 new signs in the past two years. Accidents, weathering, and other natural causes were the reasons for many replacements, but the major factor in the cost of sign maintenance is the use of signs as targets and other acts of vandalism. Although the amount spent for the purchase of new signs was great, the expense of labor and transportation required to replace the damaged signs was far greater.

Wyoming's highway signs are purchased from the sign shop of the State Penitentiary, and are made of beaded reflective sheet metal. In this way, the entire shape and message of the signs are reflectorized, rather than only the legend itself.

Fir Plywood for Traffic Signs

Either medium density or high density overlaid fir plywood may be used for traffic control signs, but the majority of the state highway departments use the overlaid type fir plywood. Medium density overlaid fir plywood is surfaced on one or both sides with a resin impregnated fiber sheet or a mixture of wood fiber and resin. This blanks out the grain pattern in the wood eliminating "grain raise" and "checking." Its surface—buff or dark brown in color —is a good base for paint, reflective buttons or similar reflective materials. (*Turn to p.* 94)

For staying power and a s-m-o-o-t-h finish...

modern

SWIMMING POOL PAINT

It's Modern POOL-COTE—especially formulated for maximum color-fastness under constant submersion and exposure — unmatched in its smooth, hard, easy-to-clean finish! Made especially for concrete and metal swimming pools, in ten beautiful colors all with a chlorinated rubber base. Pool-Cote brushes on easily, dries fast and is guaranteed not to powder or flake. What's more, Pool-Cote inhibits algae and resists water-treatment chemicals.

For more information on the complete Modern line, see your classified telephone directory for nearest distributor—or write us. **FREE!** Write today for color card and Catalog No. 13-C.

No wonder this economical, top quality Pool-Cote paint has been so frequently and firmly specified by leading architects, purchasing agents and pool operators since 1935.

modern GIVES YOU SO MUCH more...

modern SWIMMING POOL CO., INC.
One Holland Avenue, White Plains, N. Y.

New HIGH.....POWER .....TORQUE

Air MOTORS

. . . ample power to rip through tough roots and earth formations . . . full speed and torque right up to stalling point . . . safer to operate than engine or electric drives.

FASTER Pipe Installation — LESS WASTED TIME

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HYDRAUGER CORP, LTD.
681 MARKET STREET
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ARPS TRENCH HOG
Digs up to 800′ an Hour At Lower Cost per Foot

Now you can handle those profitable trenching jobs without a sizeable investment in large, unwieldly equipment! A tractor-mounted Arps Trench Hog will give you big trencher performance and capacity at only a fraction of the cost.

Along with peak capacities up to 800′ per hour, you get unsurpassed mobility — moving from one job to the next at the speed of the tractor itself. The Trench Hog is easy-to-handle — one-man operated for greater economy. Has rugged, all-steel frame; anti-friction bearings; extremely precise hydraulic depth control and independent drive wheel control for accurate straightaway and curved digging; seven digging speeds with depth capacities of 3½′, 5½′ and 7′; quick-change cutters 6″ to 20″ wide; special optional cutters for frozen and rocky soils; boom which raises to approximately 90° angle when traveling.

ARPS Trench Hog—Best For Any Trenching Job

- Water Mains
- Foundation Footings
- House Service Lines
- Sewage Ditches
- Septic Tank Laterals
- Gas Lines
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- Clogged Lines and Broken Mains

Send for free literature and detailed information. Write to Arps Corporation, New Holstein, Wis., Dept. PW

ARPS CORPORATION NEW HOLSTEIN, WIS.

TRENCHERS • HALF-TRACKS
BULL-DOZERS • UTILITY BLADES

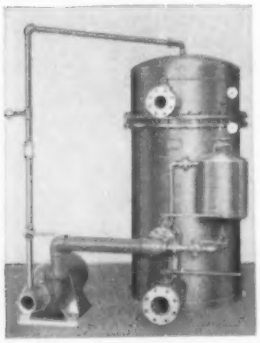
Beautiful Silver Thatch Inn, on Pompano Beach, Florida, offers its guests this lovely pool with underwater picture windows.

YES, here's another distinctive pool with the popular Adams Poro-Stone filters. More and more public pools are insisting on Adams Filters, and there are many good reasons why. Here are two of the important ones.

First, the exclusive ADAMS HI-FLOW backwash design gives you simple and easy cleaning . . . no messy disassembly . . . no scrubbing of filter elements. The high air dome and unrestricted backwash outlet provide complete purging of the filter tubes with high velocity water.

Second, rugged 4¼" O.D. PORO-STONE elements with nearly 40% open area are unaffected by corrosion. The first Adams swimming pool filter — in use since 1938 — was the first Poro-Stone Swimming Pool Filter installed in this country.

There are numerous other reasons why it pays to specify and buy Adams SPF filters. Get all the facts by writing for your copy of Bulletin 625. Use the Handy coupon below.



R. P. ADAMS CO., INC.
228 East Park Drive
Buffalo 17, N. Y.

This Adams SPF-129 Poro-Stone Filter keeps the Silver Thatch Inn pool water brilliantly polished for the enjoyment of swimmers and viewers alike. It offers 129 square feet of filter area . . . will handle pools up to 185,000 gallons capacity. It is ideally suited for outdoor pools such as is shown above.

R. P. ADAMS COMPANY, INC. M-57
228 EAST PARK DRIVE, BUFFALO 17, N. Y.

Please send me by return mail your new Bulletin 625.

Name.....Title.....
Business.....
Street.....
City.....State.....
Size of pool is.....gallons.

High density overlaid panels, also made from exterior type fir plywood, contain a higher concentration of resin in the fiber facing material. This produces a translucent, extremely hard, tough and wear-resistant surface which is highly impervious to weathering conditions. The panels are available in honey or greenish color tones. When used for traffic control signs, the panels do not require painting. Thus, reflective sheeting, such as Scotchlite, can be applied directly to its surface.

Although medium density overlaid fir plywood costs less than the high density overlaid type, and although medium density has the advantage of a very smooth and uniform painting surface, it should not be used for exterior exposure without proper paint. The painting procedure requires the application of at least two coats of a recognized sign enamel to back, edges, and face of the sign. This provides a satisfactory base for reflective type surfaces. For longer life, a three-coat paint system should be used.

High density overlaid fir plywood does not require any paint coat prior to the bonding of Scotchlite. Moreover, it is not necessary to edge-seal the panel. All that is necessary is to wipe the surface with benzene, heptane or white gas, followed by a light hand rubbing with steel wool. To this surface, the Scotchlite is directly applied. The high density overlay allows old Scotchlite to be removed and new applied.

Either of the overlaid fir plywoods may be used for virtually any type of traffic control sign. To date, there is an increase in the use of overlays in signs over five square feet. These large signs are easy to fabricate and are light in weight, simplifying installation.

Estimated Use of Water In United States—1955 Showed Increase

Hydrologists of the Geological Survey report a 34 percent increase in water use in the United States since 1950, which amounts to a total of about 440,000 mgd more than the Nation was using five years ago. In 1955, about 1,740,000 mgd of water was withdrawn from the ground, lakes and streams. This includes water for public supplies, rural use, irrigation, self-supplied industry and waterpower. Water used for the generation of power amounted to about 1,500,000 mgd, an increase of 36 percent over the amount used for this purpose in 1950. Industry comes second and irrigation is a very close third. The balance of the amount withdrawn, some 19,500 mgd, goes for domestic and rural home and stock use. Most of the water used by industry is for cooling and washing, and all but two or three percent of this is returned to a source and is available for reuse. A large part of the water diverted for irrigation, however, is "consumed," either by evaporation en route or through the transpiration process of plant life. This can amount to as much as 60 percent of the irrigation water withdrawn. Since 1950, there has been a general increase of 21 percent for all other withdrawal uses; the largest increase, 43 percent, being in the amount that is self-supplied to industry. Rural use, excluding irrigation, decreased 31 percent. The upper limit of our water supply, of course, is the average annual runoff, some 1,200,000 mgd. In 1955 about one-fourth of all water withdrawn for uses other than development of waterpower was consumed; thus annual water consumption amounts to about one-twentieth of the total supply.

SENSATIONAL PRICE LEADER!

Only $5,580

F.O.B. FACTORY

Taxes extra, where applicable. Price subject to change without notice.

Complete with backhoe, loader, power steering and shuttle transmission.

Complete machine engineered, built and fully warranted by J. I. Case Co. One responsibility . . . one service source for both tractor and equipment.

NEW CASE 320 INDUSTRIAL BACKHOE-LOADER

...outperforms any rig in its class

Here, at last, is a *heavy-duty* earthmoving outfit . . . engineered and built as an INDUSTRIAL UNIT . . . yet actually *priced lower* than many smaller capacity diggers mounted on converted farm tractors.

How can Case do it? Simply because entire machine — tractor, backhoe, loader, even the engine — is *built and factory-mounted by Case*, with only one manufacturing profit. No "hidden extras" . . . no messy split-responsibility on warranty or service.

And look at the *extra performance features* you get with the Case 320! Heavy-duty industrial bumper and radiator guard . . . recessed headlights . . . husky forged steel front axle . . . extra-heavy sub-frame assembly . . . deluxe industrial operator's seat . . . effortless power steering . . . plus the famous Case shuttle transmission, which lets you go forward or back up at *27% faster reverse speeds* — without shifting gears.

C-BL-14

Hydraulic foot-controlled 180° swing
Insures faster, easier precision digging. Machine reaches 18'7" . . . digs 12½' deep . . . has telescoping outriggers for stability.

Wide ½-cu. yd. loader-bucket
Provides 26° break-out angle, plus automatic power-leveling. Bucket also rolls forward 60° for smooth backfilling and grading.

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Find out how the Case 320's many *advanced* backhoe and loader features can help you handle a wider range of jobs at *lower cost*. Send for free "tell-all" booklet — TODAY. Also, check your requirements for other Case industrial wheel and crawler models *up to 100 hp.*

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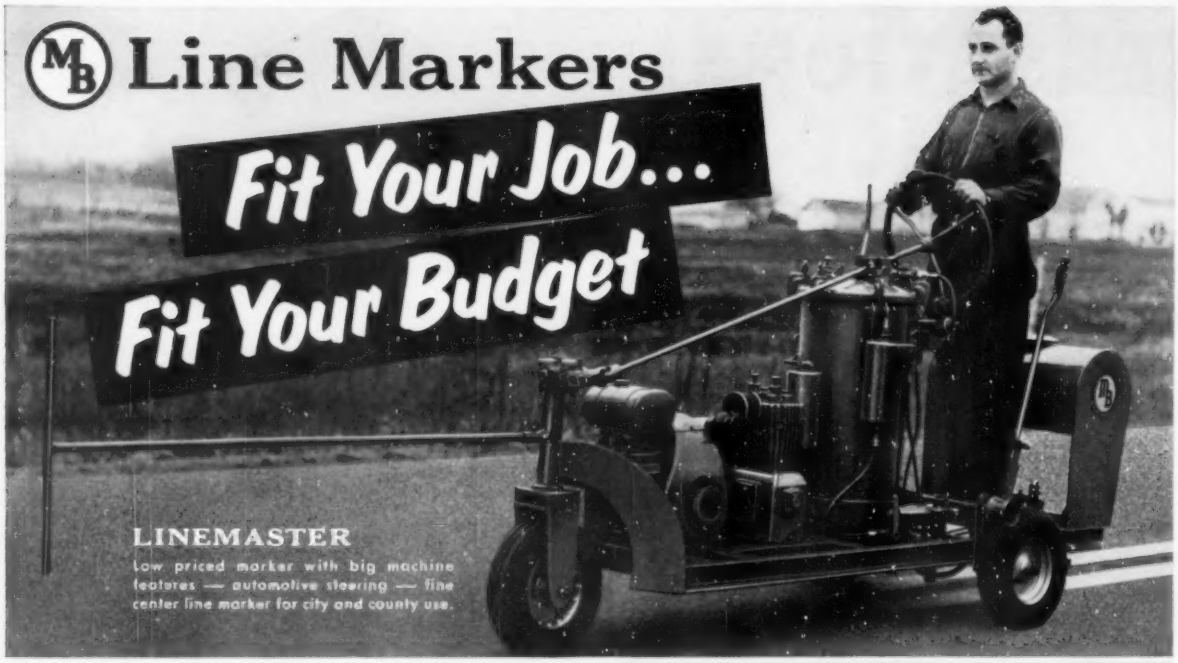
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Low priced marker with big machine features — automotive steering — fine center line marker for city and county use.

Careful selection of the right M-B Line Marker can greatly reduce the cost of your striping jobs — and only M-B offers a complete choice of line markers to fit any job — any budget. The price you pay for a marking machine is actually the lowest cost of street or highway striping. It is therefore essential to cut your operating costs, reduce maintenance expense, increase the mileage laid per hour — by using the right M-B Marker for the job.

The number of roads and streets requiring traffic lines is growing daily. Review your present striping equipment in terms of this tremendous growth — then check with the M-B distributor who sells and services in your area for helpful advice on the right size marker to best fit your requirements. You'll find how you can save money in the future by careful selection now!

Choice of 7 Sizes!

MODEL 1-10
Hand-propelled
One line — one color
10 gal. tank

MODEL 3-10
Hand or self-propelled
Single or double lines
One color — 11.2 gal. tank

MODEL 6-18
Ride on, power-propelled
One line — one color
18 gal. tank

LINEMASTER
Single or double lines
One color
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MODEL 16
Double lines
One or two colors
One 30 gal. or
two 18 gal. tanks

SUPER 10
One, two or three lines
One or two colors
30 to 120 gal.

MODEL 8
Truck mounted — Semi-custom built
Air or electro-air control

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PACKER BODIES • LINE MARKERS • SWEEPERS • PAINTS AND BEADS
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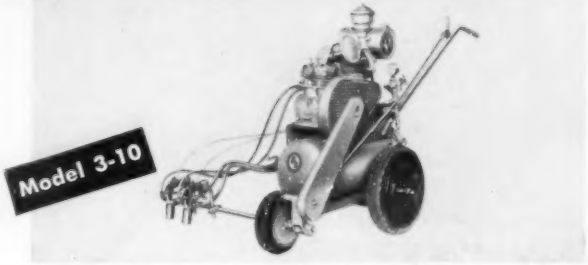
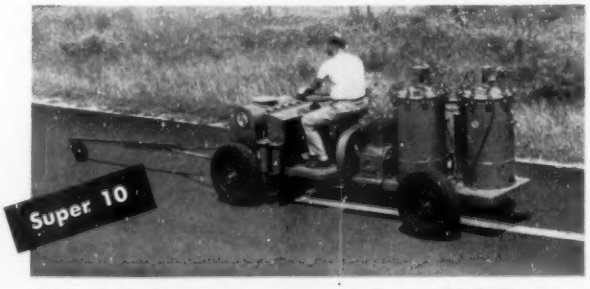


Versatile utility marker — hand-propelled or self-propelled — 10 gal. paint capacity.

Ride-on machine — easy steering for perfect curved or straight line marking — huge 18 gal. capacity.



High production, one-man operated — multiple line, two color — up to 120 gal. capacity.

Private collectors and Allis-Chalmers HD-11G team up to supply efficient, low-cost service to Illinois city

here's the way it works:

THE COMPANY — made up of 30 collectors — handles the complete garbage disposal problem for residents of Decatur, Illinois. This means 90 to 100 refuse pickups daily and maintenance of a 52-acre landfill area. Residents pay a small monthly fee for this service.

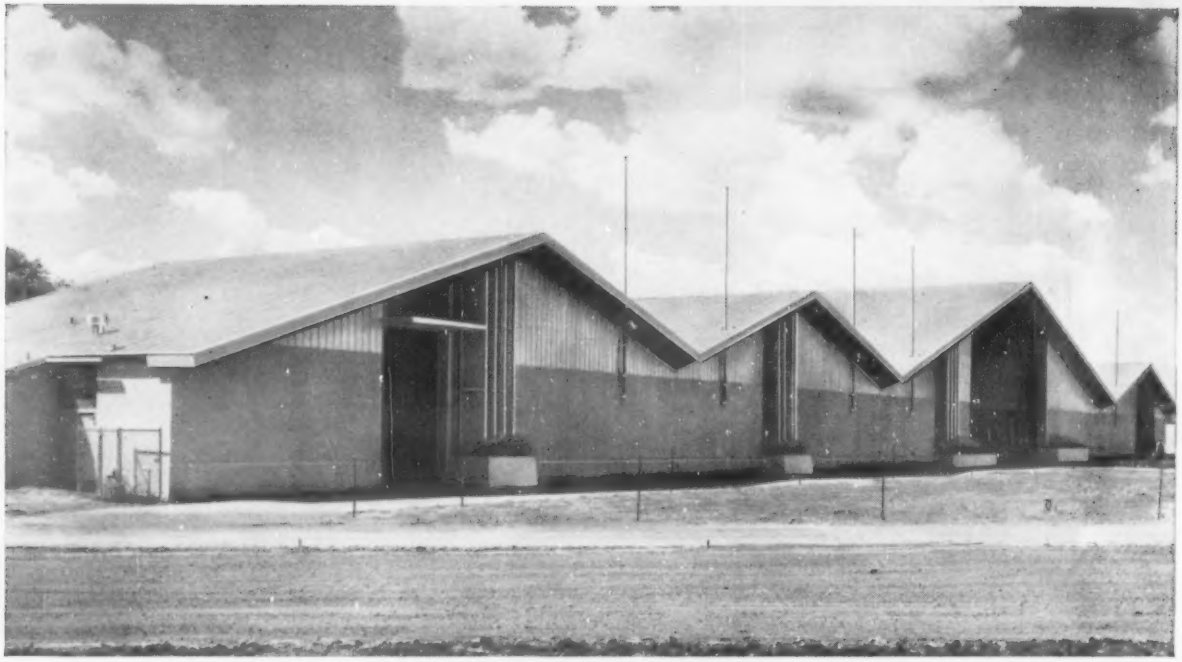
THE ALLIS-CHALMERS HD-11G tractor shovel handles all disposal work on the fill. A bucket that's almost 8 ft wide dozes refuse ... loads, carries and spreads 2¼ yd of cover material at a time. Over 32,000 lb of weight on almost 24 sq ft of track compacts the fill to reduce settling. The dynamic 105-belt hp Allis-Chalmers engine furnishes plenty of power for traction and hydraulics ... backs up the HD-11G's weight and capacity with big production punch.

• • •

Advanced-design features, versatility and job stamina, make Allis-Chalmers crawler tractors an ideal selection for sanitary landfill use. Your Allis-Chalmers construction machinery dealer will give you details and help you select the right unit for your needs from the complete Allis-Chalmers line.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS



State Fair Agricultural building at Oklahoma City, Oklahoma. Walls combine Butler metal panels with conventional materials.

Solid bank of doors provides easy entrance to this Butler fire truck garage.

Butler rigid frame provides spacious interiors free of posts and gable braces.

Impressive or simple... here's the lowest cost way to build well

Tight budget or not, your problem is still how to get the most from each construction dollar. This is true whether your community needs an impressive public showplace or a simple garage.

The Butler buildings pictured above answer this problem because they represent the lowest cost way to *build well.* They all have pre-engineered rigid frames and lifetime metal roofs. Since rigid frames support these buildings, slim, curtain walls went up quickly and economically, even though one used conventional materials and the others used Butler metal panels.

For the full story on how Butler's economical method of construction can help you help your community get the most for its construction dollar, phone your Butler Builder. He's listed under "Buildings" or "Steel Buildings" in the Yellow Pages of your phone book. Or write direct.

BUTLER STEEL PRODUCTS

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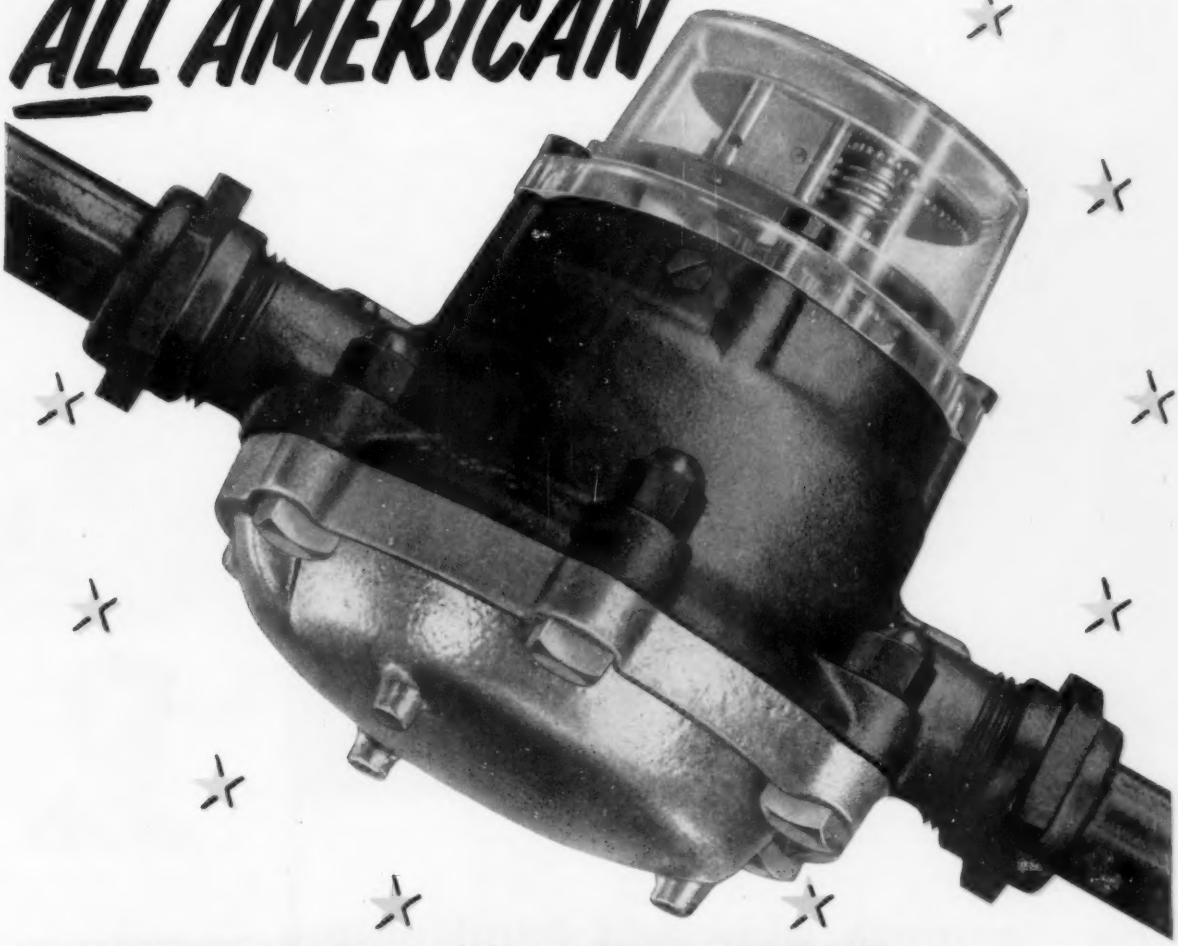
FOR THE BEST IN *Water Meters*
go ALL AMERICAN



AMERICAN METERS
Operate Silently

The whisper-quiet performance of American Meters is an achievement of American Advanced Engineering. Metal-to-metal clicking noises that originate in the measuring chamber and delicate parts that set up vibrations have been eliminated. Precision-fitted bearings of hard rubber reduce noise. All are the result of more than 63 years of meter-building experience. The silent operation of American Meters builds solid customer satisfaction, especially where meters are installed in utility rooms of compact modern homes.

If you would like to avoid headaches that arise from troublesome nuisance calls about noisy meters — "go all AMERICAN!"

BUFFALO METER CO.
2920 MAIN STREET BUFFALO 14, NEW YORK

Now...smooth, wide and handsome ...in durable Asphaltic concrete

Concord, New Hampshire's Main Street isn't a rough-riding street anymore. It's smooth-riding, quiet and comfortable. Safe and skid-resistant . . . Asphaltic concrete.

It's wider than it used to be, too. With ample space to move. To pass. To park. And modern Asphalt construction helped speed the job.

What's more . . . the entire widening and resurfacing job was done at a satisfying low cost. And traffic was maintained all through construction.

Generations to come will appreciate this new Asphalt pavement. For its smooth riding. Its durability. Its easy, economical maintenance.

From every point of view . . . including the taxpayer's . . . choose Asphalt construction on your new designs. Then you'll be sure to be safe.

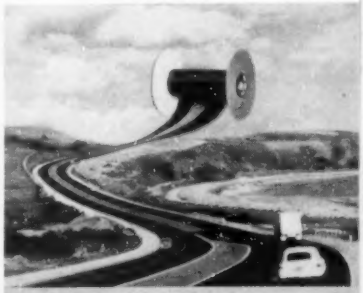
Write for a helpful new manual on Asphalt construction. **Thickness Design of Flexible Pavements for Streets and Highways** has been brought right up to the minute. It's yours for the asking. Write: Dept. X.

Mr. Woodbury Brackett, City Manager of Concord, N. H., writes:

"New Hampshire's capital city is pleased with its choice of Asphalt pavement for its busy main street.

"Traffic kept moving during construction, with a minimum of inconvenience.

"Our Asphaltic main street is easy to keep spotlessly clean, traffic lines show up clearly and pavement cuts for utility repairs are easily made and replaced."



Ribbons of velvet smoothness . . .
MODERN **ASPHALT** HIGHWAYS

THE ASPHALT INSTITUTE, Asphalt Institute Building, College Park, Maryland

HYDEPAK'S

HIGH COMPACTION LOAD
TAKES THE LOAD OFF YOUR BUDGET

LOWER...

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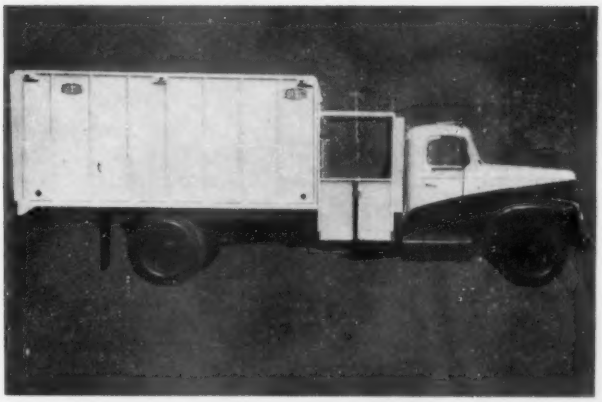
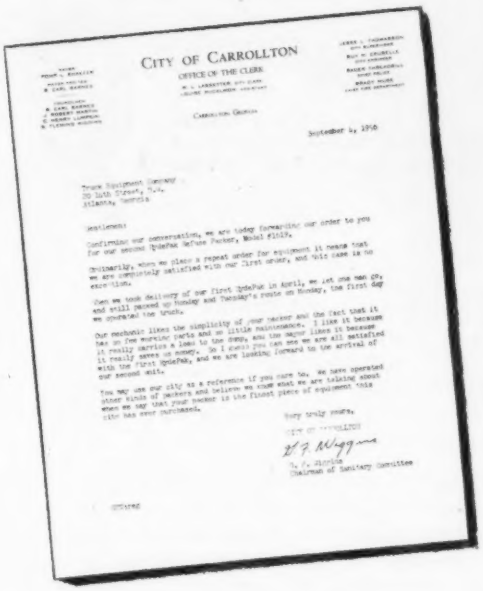
- OPERATING COST
- MAINTENANCE COST

HIGHER...

- CAPACITY
- SATISFACTION





CITY OF CARROLLTON
OFFICE OF THE CLERK

Carrollton, Georgia

September 4, 1956

Truck Equipment Company
75 Nth Street, N.W.
Atlanta, Georgia

Gentlemen:

Confirming our conversation, we are today forwarding our order to you for our second Hydepak Refuse Packer, Model #1515.

Ordinarily, when we place a repeat order for equipment it means that we are completely satisfied with our first order, and this case is no exception.

Then we took delivery of our first Hydepak in April, we let one man go, and still covered up Monday and Tuesday's route on Monday, the first day we operated the truck.

Our mechanic likes the simplicity of your packer and the fact that it has so few working parts and so little maintenance. I like it because it really carries a load to the dump, and the mayor likes it because it really saves us money. So I guess you can see we are all satisfied with the first Hydepak, and we are looking forward to the arrival of our second unit.

You may use our city as a reference if you care to. We have operated other kinds of packers and believe we know what we are talking about when we say that your packer is the finest piece of equipment this city has ever purchased.

Very truly yours,

CITY OF CARROLLTON

W. F. Wiggins
Chairman of Sanitary Committee

Attest

Wherever HYDEPAK has been put to the test it has proven its value time and again.

HYDEPAK has been designed to do the most efficient job for the least possible cost. Simplicity of construction of this unit enables the manufacturer to pass along great savings to you, and, at the same time provide the most efficient refuse collection unit on the market today. Due to the simplicity of construction, HYDEPAK units have less complicated parts that are prone to wear out, and thus reduces maintenance problems. These units not only provide a considerable saving on initial cost but also on day-to-day maintenance.

The HYDEPAK has been designed so that a lighter more economical truck body can be used, and also a smaller crew can load more refuse per load than in any other unit. High compaction under pressure utilizes every available cubic foot of the HYDEPAK. No space is lost to complicated and cumbersome machinery. Compare this unit with any packer of equal size and weight and HYDEPAK will prove its superior performance at less cost.

Available in 13 yd., 16 yd., 20 yd., and 24 yd. capacities this unit is unsurpassed in price, quality, service and capacity.

FOR INFORMATION WRITE

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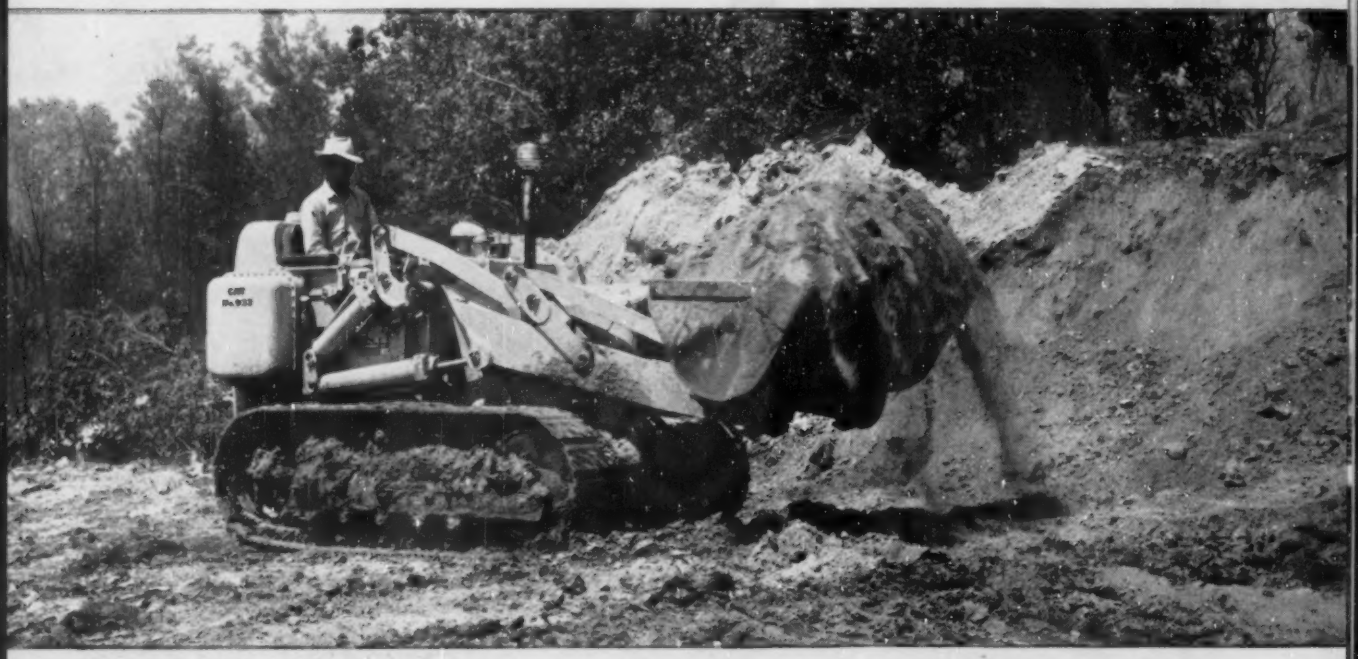
HYDE CORPORATION

P.O. BOX 1265

FORT WORTH, TEXAS

For Sanitary Landfill—the No. 933 Traxcavator*



"It's performing like the dealer said it would"

R. A. Burleson
City Engineer and Director of Public Works
City of Grande Prairie, Texas

In an abandoned gravel pit two miles north of the City of Grand Prairie, Texas, this community-owned CAT* No. 933 Traxcavator is engaged in a sanitary landfill operation. The pit is 20 to 30 feet deep and covers some eight acres.

Chief benefits to the community from the operation: elimination of open dumps; conversion of abandoned, useless land into valuable property; and removal of the gravel pit as a breeding ground for disease-carrying insects and rodents.

The town's decision to buy the No. 933 Traxcavator last year stemmed from its experience with two Caterpillar No. 112 Motor Graders. "Service is a big item with us," explains R. A. Burleson (above), "and we had practically no trouble with our motor graders. That's why we picked the No. 933 Traxcavator—and it's performing like the dealer said it would."

The excellent performance that has impressed Mr. Burleson is a result of the No. 933 Traxcavator's balanced unit design, which enables it to handle a heaped bucket in faster cycle time than competitive machines of similar size and horsepower. Forty-degree tilt-back gets a maximum load into the one-yard bucket on every pass. Powerful hydraulic cylinders mean that the load is lifted and dumped quickly.

Let your Caterpillar Dealer show you the Traxcavator line. He'll give you all the facts *and* demonstrate their performance. You, too, will find that Traxcavators perform just the way he says they will. And as an owner of Caterpillar-built equipment, you will have the added protection of reliable service and Caterpillar parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

*Caterpillar, Cat and Traxcavator are Registered Trademarks of Caterpillar Tractor Co.

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE

PUBLIC WORKS MAGAZINE
VOLUME 88, NUMBER 3
MARCH, 1957

UNATTENDED PUMPING STATION SOLVES Lake Pollution Problem

W. H. BRACKETT
Electric Machinery Mfg. Company

THE OLD Lake Avenue Pumping Station in Worcester, Massachusetts, was in use for many years pumping sewage over the hills of Worcester to the local treatment plant. The station was located on the west shore of Lake Quinsigamond, which is quite a summer resort.

In time the capacity of the pumping station became inadequate to handle peak loads, and its reliability was questionable. When a failure occurred or the load became too great for the pumps to handle, sewage would overflow from the suction well into the lake. When the State of Massachusetts took the lake over as a recreation area, the City decided to enlarge the station, which was done in 1952. The State insisted on having all precautions taken to eliminate the possibility of overflowing into the lake. Therefore it was decided to install emergency generating equipment to guard against power failures.

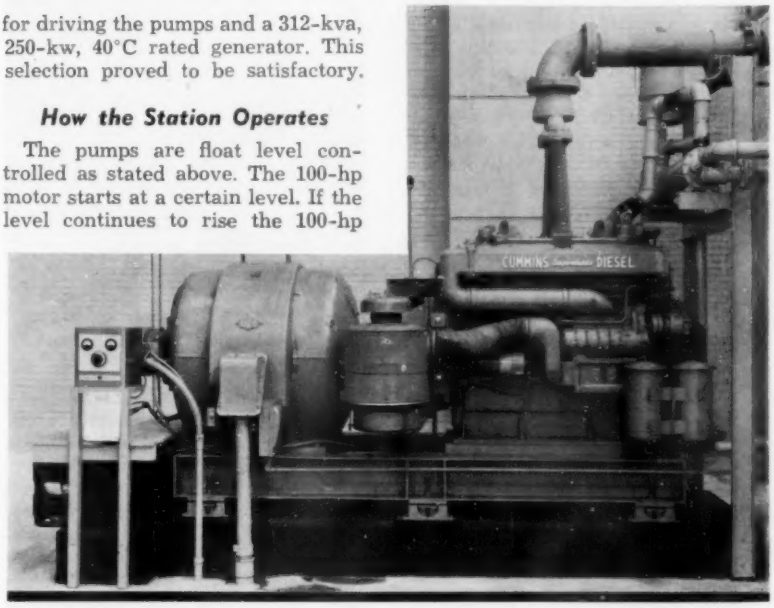
The station was designed as an automatic, float level controlled and unattended installation. The equipment installed consisted of one 100-hp pumping unit, two 200-hp pumping units and one 250-kw diesel generating unit, each with its attending switchgear, and also a load center to supply 480-volt power from the 2300-volt incoming line. One 200-hp pumping unit would handle any peak flow for some years. The emergency diesel engine generating unit had to be able to start one of the 200-hp motors without dropping any other auxiliary motors off the line.

After extensive study by the consulting engineers, Camp, Dresser & McKee, it was decided to use part winding start, synchronous motors for driving the pumps and a 312-kva, 250-kw, 40°C rated generator. This selection proved to be satisfactory.

How the Station Operates

The pumps are float level controlled as stated above. The 100-hp motor starts at a certain level. If the level continues to rise the 100-hp unit is stopped and a 200-hp unit takes over. It pumps down to the minimum level and stops. As the level rises the 100-hp takes over again and unless it can keep the level from rising it stops again and the 200-hp unit takes over once more. If the level should continue to rise with the 200-hp unit pumping, then the second 200-hp unit starts. It was not expected to have this happen and it has not happened in three years of normal operation, but in cases of heavy downpour, sufficient leakage into the sewerage system has required two 200-hp pumps in operation.

In case of a power failure the emergency generator starts. When the generator voltage is up to 480 an automatic transfer switch connects the 480-volt bus to the generator and the station gets power. Simultaneously a signal is transmitted to the supervisor, who calls the operating division. They expect to have an engineer at the station in twenty minutes. At one time this signal failed to go through and the station operated for several hours on the emergency generator before an engineer going by noticed the condition. Though the generator starts automatically it is shut down manually by the engineer when he is sure of continuous supply of power being available again.



● **DIESEL generator set is an emergency stand-by unit. If line power fails, the engine starts automatically and supplies power to pump motors. Shut-down is manual.**

The engine is cooled by water from the city supply through a heat exchanger, with a solenoid valve opening when the engine starts. Safety devices are provided to give an alarm but not to shut down the engine on account of the seriousness of a shut-down. The emergency set is put through its paces once a week by pulling out the supply switch, thus simulating a power failure. Instances of power failure have averaged at least twice a month and usually occur during a storm when extra pumping is needed.

There has never been a case of the motors failing to start nor of any overflow into the lakes.

Why Build
SOIL CEMENT ROADS?

J. T. SHARPENSTEEN,
Genesee County Highway Engineer,
Flint, Michigan

WHY THE Genesee County Road Commission builds soil cement roads is a pertinent question. Many answers can be given. If looking for basic reasons, one might go back to prehistoric times when glaciers covered Michigan and more especially to the time when the ice receded leaving numerous gravel deposits.

As a result of these gravel deposits, all county roads were originally improved with gravel surfaces. There are 1400 miles in the county road system of which 1100 miles are surfaced with gravel. A major portion of the gravel surfaces were built in the twenties and thirties. Gravel deposits were available in every township at that time; but these have since been largely depleted and it now appears that the time is not far distant when maintenance gravel will have to be shipped in by rail or brought by long truck haul from other counties having gravel deposits commercially developed.

Many types of soil are found in the county, ranging from sand to heavy clays, with clay the predominant type. Heavy soils in conjunction with large level areas present serious drainage problems, both for road building and land utilization.

● **PORTABLE cement bin, 500 bbls. capacity, loading motor truck.**

Our population has mushroomed in the last few years and is now estimated at 400,000. The rapid expansion of industry in the county has brought with it many problems and the construction of adequate highways has not kept pace with the need for highway transportation. The State Highway Department has found that state trunk lines, all with unlimited access, are wholly incapable of handling the rapidly increasing volume of traffic. In a desperate effort to catch up, the Department has 32 miles of expressway under construction in Genesee County at the present and is expected to build 25 miles more in the near future. Other two-lane State trunk lines are being converted to four-lane divided highways as rapidly as possible.

Going back more than 40 years, history reveals that the planning and construction of Genesee county roads has always been under the direction of competent engineers. This fact, coupled with a level terrain, resulted in alinement that seldom requires any change and gradients which need no reduction for heavy truck traffic. Drainage structures had competent designers and the present day condition of these structures indicates their construction had good supervision.

Along with the urgent need for the elimination of gravel surfaces, highway needs studies indicate 160 miles of two-lane pavement should be widened to four lanes, mostly within 10 years.

Now we come to the immediate reason for building soil cement in

● **MECHANICAL cement spreader is distributing 0.09 barrel of bulk cement per sq. yd. per 10-foot pass.**

● **ONE-PASS stabilizer mixes cement and soil, adding 2 or 2.5 gals. of water per yd. Speed is 24-33 ft./min.**

this county. The income of the Road Commission is not sufficient to build high-type surfaces such as concrete pavement, or asphalt surfaces on bases and sub-bases that can be expected to carry the traffic without premature failures. The rapidly dwindling supply of maintenance gravel, with a rapidly increasing traffic volume, indicates a major portion of the gravel roads cannot be maintained much longer except at excessive cost. Obviously, under the circumstances, it is imperative to utilize some type of construction which provides an all-weather surface, and will permit the salvage and use of the large amount of gravel now on the roads. We are convinced that soil cement is an answer to that problem.

First Soil-Cement Project

In 1951 we started to experiment with soil cement by converting two miles of gravel surface to a soil cement base with a double bituminous seal wearing surface. There were two 1-mile projects on opposite sides of the county. The two projects were built as nearly alike as possible but on different types of soil, one on a heavy clay, the other on Berrien sand. The latter had broken up every spring and was impassable for extended periods.

The soil cement bases were built 20 feet wide and 6 inches thick compacted, using 8 percent Portland cement by volume as recommended by the Portland Cement Association. Methods and equipment seem somewhat crude and daily production was small when compared to present day accomplishments. The cost of these jobs offer some interesting facts. A one mile section of surface treatment pavement on McKinley Road cost $1.00 psy. Another one mile section of the same type of construction on Judd Road cost $0.90 psy.

After a year, the first soil cement road constructed in the county showed no signs of failure and in every way seemed to offer promise as a satisfactory type. Accordingly, it was decided to experiment further with soil cement and five miles were scheduled for construction during 1952. There had been considerable demand for more all-weather type construction on McKinley Road, and since this road was carrying 1100 vehicles every 24 hours, it was decided it offered excellent opportunities for further testing of soil cement.

Construction was carried on in about the same way as in 1951, which meant that cement was delivered to the job in sacks and that agricultural equipment such as disc harrows, spring tooth harrows, spike tooth harrows and even plows were employed for mixing. Along with the farm equipment, motor graders, rotary pulvi-mixers, rubber-tired rollers, steel-faced rollers, sheepsfoot rollers, tractors and other units of road equipment were used. Completion of a half-mile a day was considered satisfactory production. Moisture control and compaction, although considered of the utmost importance at that time, were by rule-of-thumb methods. The cost of the project was $1.12 psy with the double surface treatment included in the cost.

In 1953 the pressure of other construction precluded building any soil cement bases. For 1954, four projects totaling 4.89 miles were placed on the construction program. One of these was an old black top road which had to be scarified and required considerable effort to break up large pieces of bituminous mat. Another of the projects was originally built on light sand and most of the gravel used in the original surface had disappeared, resulting in the necessity for stabilizing sand with a small amount of gravel present. This job produced some expected problems in compaction. It was found that a sheepsfoot roller was useless on account of the instability of the base against which compaction had to be made. Compaction was obtained by repeated passage of heavy track-laying tractors over the road. The other two projects presented no unusual problems.

The main difference in this year's work from the two previous years was the kind of mixing equipment used. A contract was let for the mixing to be done with a P & H one-pass stabilizer which mixed a 10-foot, 3-inch strip at a single pass and added the necessary water. All other items of work were handled by Road Commission forces. As in previous years, cement was delivered to the job in sacks which required a large number of men to unload, open and dump on the road surface. It was necessary to have all the cement on the road by 1 P.M. in order that mixing, rolling and finishing could be completed by the regular quitting time.

The average cost per mile for building these four jobs was $1.12 psy including the cost of a double-surface treatment.

No defects having been observed in the three previous years' construction, it was decided to continue construction of soil cement in 1955 on a limited scale. The program in-

● **SHEEPSFOOT** roller with double drum packing out soil-cement mix. Speeding up this step is desirable.

● **FINISHING** of base employs 10-ton steel wheel roller, multiple wheel rubber tired roller and drag.

● **MOTOR grader follows the sheepsfoot roller and shapes the compacted section.**

cluded three projects totaling 5.35 miles. Practically the same methods and the same equipment used in 1954 were employed in 1955. As in previous years cement was delivered to the job in sacks. The average cost psy on all projects was $1.30.

It was decided in 1956 to build 29 miles of soil cement roads involving 343,320 square yards. Methods and equipment used previously did not offer much hope of completing the job in one year, unless favored by fair weather over a long construction period. It was also recognized that construction costs had been rising with each succeeding year. After a careful appraisal of these factors, it appeared imperative that something else must be tried that offered hope of increased production at a lower cost.

The first change decided upon was to abandon the use of cement in sacks in favor of bulk cement. Just how to unload it, provide storage and finally spread it on the road had to be solved. To unload from bulkers and provide storage, a 500-barrel bin, which had to be reasonably portable, was ordered. A bulldozer was used to excavate pits into which trucks could be driven and into which the bulkers unloaded directly. By supplementing the unloading capacity of the bin in this manner no delay was experienced in getting the desired amount of cement on the road at the proper time.

For spreading cement, a Hercules cement spreader was purchased. Chevrolet dump trucks carrying 30 barrels each were used to deliver cement to the spreader. This operation worked satisfactorily but it is believed it could be improved by using trucks of greater capacity, thereby reducing the number of times required to back into and hitch the spreader to the truck.

Except for some refinements, mixing and finishing were handled about the same as in 1955. There were some changes in the manner of sealing or providing a wearing surface. In some cases a single curing seal of asphalt emulsion (AE3A) was applied within a day or two and subsequently 150 pounds per square yard of plant mix asphalt was laid. This provided a much smoother riding surface than can be secured by a 5-pass seal.

One of the refinements that seems worthy of note was a traveling laboratory which was kept on the job at all times for the purpose of checking moisture in the mix as well as both moisture density and dry density. ASTM methods of testing were employed. Equipment for the laboratory consisted of a station wagon and the following:

1—Moisture density mold (H-4225); 1—moisture density rammer (H-4160); 1—Pycnometer (H-4245); 1 scale, model 601, 36# capacity (H-4670); 1—2-burner Coleman stove, model 425B; 1—12-in. steel rule; 1—large spoon; 1—mason hammer; 1—12-in. butcher knife; 8-in. and 10-in. frying pans; 2—10 qt. pails, galvanized; 1—salt shaker; 1—G.I. trench shovel; 1—1-gal. gas can; 1—#4 U. S. standard sieve; 1—small wood chisel; 1—2-in. paint brush; 1—notebook with necessary forms for recording test data; 1—50-ft. steel tape.

One thing that should be kept in mind is that a laboratory on the job will not and cannot supplant experience. During the time that it takes to make a test the mixing machine may have moved a half mile down the road, encountering conditions that required a half dozen changes in the amount of water used. An experienced man behind the mixing machine is a must.

Production was at a much greater rate than anticipated and ran as high as 16,084 square yards in a regular 8½-hour work day. To understand the cost classifications, the following definitions are given:

Preparing Grade: This includes shaping of grade, scarifying, ditch cleanout as required, replacing cross-culverts as necessary, and placing of new gravel in some instances. This item varies with each job and a separate cost per sq. yd. is given with this item deleted.

Cement Spread: This includes all handling costs of the cement plus the cost of cement.

Mixing: This is the price paid to the contractor for mixing and adding water to the material in place.

Finish: This includes all compaction, blading and final rolling as required.

Seal: This includes all labor and equipment for the placing of a limestone and emulsion (AE3A) seal. An indication is given in each case as to type of seal placed. A 5-pass seal means five 10-foot spreads

● **FINAL finishing is by rubber-tired rolling following a light application of water. Near optimum moisture content is important in the finishing operation.**

with the fifth and last pass being placed in the center.

A breakdown for the actual cost for one of the typical projects is as follows:

Project 233 C-1—Torrey Rd.

Item of Work	*Cost*	*Cost PSY*
Prep. Grade	$ 4,717.93	$0.044
Cement Spread	43,092.01	0.399
Mixing	24,850.58	0.230
Finish	7,226.10	0.067
5-Pass Seal	24,639.84	0.227
Totals	$104,526.46	$0.967

Total square yards processed: 108,046

Cost psy excluding grade preparation 0.923

Cost per mile $0.923 x 11,880 = $10,965.24

There was a total of 343,320 square yards processed in these projects. The average cost was $0.97 per yard or $11,523.60 per mile. There may be some question as to whether preparing grade is a legitimate charge against soil cement construction. If that item is left out the cost per square yard is $0.895 and the cost per mile $10,623.00.

Near the end of the regular construction season four more projects were put under contract and completed. The combined length of these jobs was 4.1 miles and they required the construction of 62,036 square yards of soil cement base. This yardage, added to that completed earlier, makes a total of 405,356 square yards built on 33 miles of road in 1956. In previous years 204,811 square yards was constructed which makes a total of 610,167 square yards on 50.34 miles in use.

Reduction of cost is usually uppermost in the mind of anyone responsible for the construction of highways. Already consideration is being given this important factor. It is obvious at this time that there is little chance for a decline in the price of materials essential for soil cement construction. There is no hope that labor cost will be less but there is strong indication that it will increase. Equipment cost, like labor, will probably increase. In spite of increasing costs, it appears that unit costs may be further reduced. Obviously, the only way this can be accomplished is by increased daily production without a corresponding increase in the cost of labor or equipment.

● **CURING coat of asphalt emulsion is followed by a cover of crushed limestone.**

Heretofore a single mixing unit has been used. The time required for initial set of Portland cement usually makes it advisable to mix half the width of the road for a distance of 500 or 600 feet and then back up and bring up the other side. There is delay in backing up, not only in case of the mixing machine but also the finishing equipment has to stop for at least a part of the time while the backing up takes place, and for a part of the time while the second half of the road is being mixed. It is therefore impossible to come near to maximum production with finishing equipment when half the width of the road has to wait until the other half is mixed.

The solution of this problem lies in mixing both sides of the road simultaneously. To do this requires two one-pass mixing machines. Backing up of the mixing machine will be eliminated and the whole width of the road will be available to finishing equipment without intermittent delays. Obviously, the two mixing machines can process more than double the amount of a single machine in a given time because no time is lost in backing up and the same finishing equipment necessary for a single mixing unit will be able to handle all the finishing because it can keep working steadily. Where one mile a day has been considered good production for a single mixing machine, two or three miles a day can be expected without increase of finishing cost when two machines are used. The general speeding up of the job is sure to result in other savings.

So far the cost of surface maintenance has been negligible. Soil cement has met with public approval and there is a growing demand for increased construction. Results so far warrant a substantial increase in future construction. Our program for 1957 has not yet had final approval, but it is believed a mileage at least double the 1956 program of 33 miles is feasible and desirable from all points of view.

Editor's Note: Mr. Sharpensteen presented a paper on this subject at the recent meeting of the American Road Builders Association in Chicago, using essentially the same data and illustrations.

● **PORTABLE laboratory is utilized to check field construction adequacy. Here a standard mold to establish field moisture-density relationships is being prepared.**

What is the WATER USE of the PUBLIC AWAY FROM HOME?

Design data on sewage flows and water use for turnpike service areas, motels, drive-in theaters and similar places that require their own waste treatment facilities

INCREASINGLY, engineers are required to design sewage treatment facilities for turnpike or toll road service areas, motels, drive-in theaters, supermarkets, shopping centers and similar establishments. Very often these places are located where they cannot be served by municipal sewerage systems or water supplies and where the flow in receiving streams is small, necessitating a high degree of treatment.

Effective and economical treatment plant design requires a reasonably accurate knowledge of the volumes and strengths of sewage that will be encountered, yet information of this sort has been lacking. To remedy this situation, the editors of PUBLIC WORKS wrote to state sanitary engineers and many others with knowledge and experience in the field. Comments received include the following:

Alabama: Arthur N. Beck, Chief Engineer and Director, Bureau of Sanitation, State Dep't. of Health: "Our State Highway Department has asked us to design water and sewerage facilities to be provided at rest areas proposed for development along superhighways. We are advised that 50 stops per day per station will be the design criteria. Lacking more reliable information, we are estimating water use for 200 persons at the rate of 10 gallons per person per day. Sewerage facilities will be designed accordingly."

Connecticut: Warren J. Scott, Chief Sanitary Engineering Services, State Dep't. of Health, reports that the data prepared by Prof. John E. Kiker (Bull. 28, Dec. 1948, College of Engrg., Univ. of Florida) has been sent to all local directors of Health. (A more recent recommendation by Prof. Kiker is given later in this article).

Iowa: P. J. Houser, Director, Division of Public Health Engineering: "Since mobile home parks have been required to be licensed by the department for the past two years, we have reviewed a few plans for new sewerage systems. The sewage treatment plants are designed on the basis of 50 gals. per capita per day or 125 gals. per trailer space per day. This quantity appears to be reasonable, and the plants thus designed appear to be functioning satisfactorily. The 2.5 persons per trailer has also been checked as being reasonably accurate on the basis of existing installations."

Kentucky: Ralph C. Pickard, Director, Division of Engineering, sends the recommendations of the State Department of Health, and adds: "We do not propose these as the only answers, since we do not know the reliability of the information. For instance, the recommendations for schools seem slightly high at this time and may need to be revised." The recommendations are: For schools, 10 gpd per pupil, plus 5 gpd for showers and 5 gpd for cafeteria; for restaurants, 10 gals. per person, including kitchen and 3 gals. per meal. Other data include drive-in theaters 3 gals. per car; trailer court 100 gals. per trailer; and motor court or motel 125 gals. per unit.

Massachusetts: Clarence I. Sterling, Jr., Chief Sanitary Engineer, Dep't. of Public Health, encloses "a sewage flow data sheet used in estimating flows. This sheet is based on data made available by the Public Health Service, but each installation is considered separately. . . Water consumption records of similar businesses are available at most of the municipal water departments in Massachusetts and designers can make use of this information". An accompanying sheet listed usage per person per day as follows: Restaurants, toilet and kitchen wastes per patron, 7 to 10 gals.; kitchen wastes per meal served 3 gals.; hotels, camps and boarding houses, 3 meals per day, 7 to 10 gals.; resort camps with limited plumbing, 50 gals.; work or construction camps, 50 gals.; public picnic areas, toilet wastes only, 5 gals.; drive-in theaters 3 to 5 gals. per stall; swimming pools and bathing places 10 gals. Many other items are listed also.

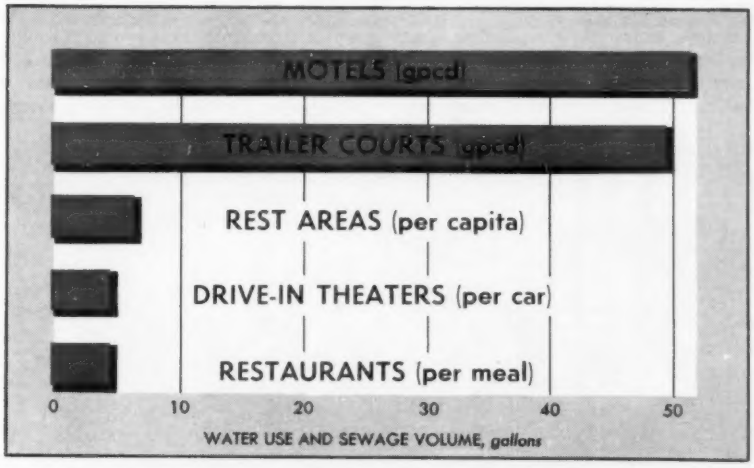
New Mexico: Aubrey L. Willard, Associate Engineer, Dep't. of Public Health: "The New Mexico State Uniform Plumbing Code, 1956 edition, gives the following minimum design flow requirements: Drive-in theaters and service stations, 5 gals. per space per car; auditoriums and theaters, 5 gals. per person per day; tourist courts and trailer camps, 120 gals. per space per day; restaurants, 2½ gals. per meal served; dwellings, 50 gals. per person per day, which is increased 50 percent if garbage grinders are contemplated or installed. The requirements for gymnasiums are based on 3 gals. per spectator and 10 gals. per participant.

North Carolina: J. N. Jarrett, Director, Sanitary Engineering Division, State Board of Health, reports as follows: Cafes and restaurants, 30-gals. per 8-hour day for regular workers, plus 5 gals. per meal served; motor courts, 50 gals. per day per maximum number of guests and 100 gals. per day for permanent residents, as owners and operators; trailer camps, 150 gals. per day per trailer space available; drive-in theaters, 7½ gals. per car

AND SEWAGE VOLUME

space; gasoline filling stations, 30 gals. per day per employee and 5 gals. per estimated user.

Ohio: F. H. Waring, Chief Sanitary Engineer, State Dep't of Health, forwarded a "Sewage Flow Guide" which was prepared by District Engineers based on experience and usually take water from drilled wells. The individual cottages are equipped with lavatories, flush toilets and showers. Based on meter readings, the average daily consumption is 70 gals. per capita. Where toilet and shower facilities are centralized and the individual



● **AVERAGES of reports from several agencies. Complete figures are in the text.**

all the data they could obtain. Some of the daily values are: Trailer parks, 125 gals. per trailer space; motels, no food service, 75 gals. per unit; drive-in theaters, 5 gals. per car space; youth and recreation camps, 50 gals. per camper; assembly halls, no food service, 2 gals. per seat; office buildings, no food service, 20 gals. per person; elementary schools, 15 gals. per pupil; high schools, 20 gals. per pupil. For food service operations, an "average restaurant," 35 gals. per seat; 24-hour restaurant, 50 gals. per seat; tavern, 20 gals. per seat.

Pennsylvania: L. D. Matter, Chief, the Water Supply Section, writes: "We have no instance of a shopping center which has had to develop its own water supply, primarily because these are mostly situated on the edges of areas already served by public-water supplies. We have some data on Turnpike Rest Stations. In a typical case, the average per capita water consumption is around 60 gals. per day. In this case overall design provided for 120 gals. The source of supply is wells and more can be drilled.

"Large public camps, with an average population of around 400, cabins contain only lavatories, the average per capita use is 55 gals."

Utah: Lynn M. Thatcher, Chief, Bureau of Sanitation, reports that "some time ago we checked water usage at a variety of installations and arrived at these figures: Camps, 25 to 40 gals. per person per day; churches 1 to 5 gals. per person; theaters, 1 to 1½ gals. per seat; drive-in theaters 2 gals. per car space; trailer courts, 125 gals. per trailer space; fairgrounds, 1 gal. per capita daily attendance; restaurants, 10 gals. per meal; and service stations, 500 gals. per set of pumps. To our knowledge sewage disposal facilities designed on these quantities have operated satisfactorily."

Virginia: W. H. Shewbridge, Director, Bureau of Sanitary Engineering, State Dept. of Health, states: "For the most part, the large supermarkets and shopping centers constructed in our state have been in areas where central water and sewerage systems have been available. We have had a preliminary proposal from one engineer which covers the installation of a shopping center, a motel and a small housing development. In his design criteria covering water use and waste from the shopping center, he has utilized for the basis of design the estimate of one person for each 300 sq. ft. of area in the shopping center; and further has applied the usual 100 gals. per day as the design criteria. Perhaps this is one method of arriving at flows. It may be liberal; however, we accepted this particular recommendation regarding sewage flow from the shopping area."

West Virginia: G. O. Fortney, Division of Sanitary Engrg., State Dep't. of Health, says: "The following volumes of sewage flow have been determined by actual measurement of the amount of water used or sewage produced at specified chosen places throughout the state: Motel, 60 gals. per person per day; drive-in theater 4 gals. per car stall; restaurant, 7 gals. per meal; grade school, no showers, 10 gals. per person per day; junior and senior high schools, with showers, 15 gals. per person per day; residential subdivision, 50 gals. per person per day."

Other Data

In none of the replies was any information given on the strength of the sewage. It was assumed by some, and is probably the case, that such waste is of the normal strength of domestic sewage. However, where restaurant wastes constitute a considerable volume, it was generally felt that grease traps would be necessary.

Most complete information came from Prof. John E. Kiker, Jr., College of Engineering, University of Florida. This included some material prepared for the "Manual of Septic Tank Practice" which will be issued by the Public Health Service. Hence there is no restriction on its republication so far as this magazine is concerned. Included in the information he sent are: Restaurants, toilet and kitchen wastes per person, 7 to 10 gals.; per meal served 2½ to 3 gals.; and additional for bars and cocktail lounges, 2 gals. per person served. Tourist camps or trailer parks, central bath, 35 gals.; individual bath units, 50 gals.; work or construction camps, semipermanent, 50 gals.; day camps, no meals served, 15 gals. Picnic areas, toilet wastes only, 5 gals. per picnicker; picnic areas with showers and flush toilets, 10 gals. Swimming pools and

(*Continued on page* 210)

TRAINING TRAFFIC ENGINEERS

FRED W. HURD,
Bureau of Highway Traffic,
Yale University

WE ARE ENTERING into an era of our highway transportation development when large sums are to be expended in the improvement and extension of the nation's streets and highways. This highway replacement program poses many engineering problems, but, perhaps, the most important is the need for traffic engineers to help locate, design and operate the facilities so they will serve traffic efficiently and safely.

Highway development in the United States has passed through three principal stages: Construction, the pioneering stage of highway transportation; the Accident and Congestion Stage because of inadequate design; and the Traffic Operations Stage.

Traffic engineering embraces the planning and design of streets and highways, and the regulation of traffic movement thereon. It deals with the forces of motion, the statistics of human performance, the mechanics of the machine and the economics of a transportation medium. The scientific nature of traffic engineering was recognized when the first course, at the graduate level, dealing with this highly specialized form of engineering was established at Harvard in 1926. In 1938, it was moved to Yale University as the Bureau for Highway Traffic. Principal topics are:

1. *Traffic Characteristics and Measurements*—the study of the fundamental traits of highway traffic including the statistical analysis of traffic measurements.

2. *Regulations and Control*—the theory, design and application of traffic regulations and traffic control devices.

3. *Traffic Planning and Design*—the economics of road location and geometric design of facilities having inherent safety and high quality operational characteristics.

4. *Administration*—the administrative problem of the city and state traffic engineer, including study of broad policies dealing with highway needs, finance and economics.

To be admitted to the course, applicants must have a degree from an accredited college, preferably in engineering. In accepting students for enrollment, important consideration is given to the quality of their undergraduate record and their aptitude for highway traffic work.

● **TRAINING program is devoted wholly to highway traffic engineering. Here a group of students are discussing problems of planning, design and administration.**

About 250 graduates of the Bureau are now employed by divisions of state, county and city government, and other public agencies dealing with street and highway traffic matters. Graduates of the Bureau are principal or assistant traffic engineers in twenty of the state highway departments and in over half of the cities with population of 100,000 or more. They are practicing in forty-three states and hold key traffic positions in twenty-four foreign or overseas nations.

Objective of the Training Program

The training program is devoted exclusively to highway traffic. The intent of the program is to give engineers a high degree of traffic operations knowledge so they may assume responsible positions in traffic engineering work immediately upon graduation. The courses have been set up for men who will help overcome the current critical shortage of qualified traffic engineers and not for those interested primarily in obtaining a higher degree in engineering. Those who successfully complete the requirements of the course receive a Certificate in Highway Traffic to signify their accomplishment. However, traffic engineering course credits may be applied toward an advanced degree in broader phases of engineering.

To encourage promising engineers into the field of traffic engineering, a number of fellowships have been made available to students. These provide for tuition and a $175 per month stipend during the course of eight months. Tuition scholarships are also available to qualified men who are paid a salary by their employers while they are attending the course. The course starts in September each year and applications must be received by March first.

It is estimated that over 1200 qualified traffic engineers are needed in government work. Also, since most present day activity is directly related to highway traffic, an untold number of opportunities exist for traffic engineers in business, service organizations and other enterprises.

● PILOT plant was set up at the Rockford, Ill., sewage treatment plant to study possibilities of sludge utilization.

Treatment of Sewage Sludge by the McDonald Process

R. H. STOLLEY,
Hills-McCanna Company, Chicago,
and
E. H.FAUTH,
Barber-Greene Company, Aurora, Ill.

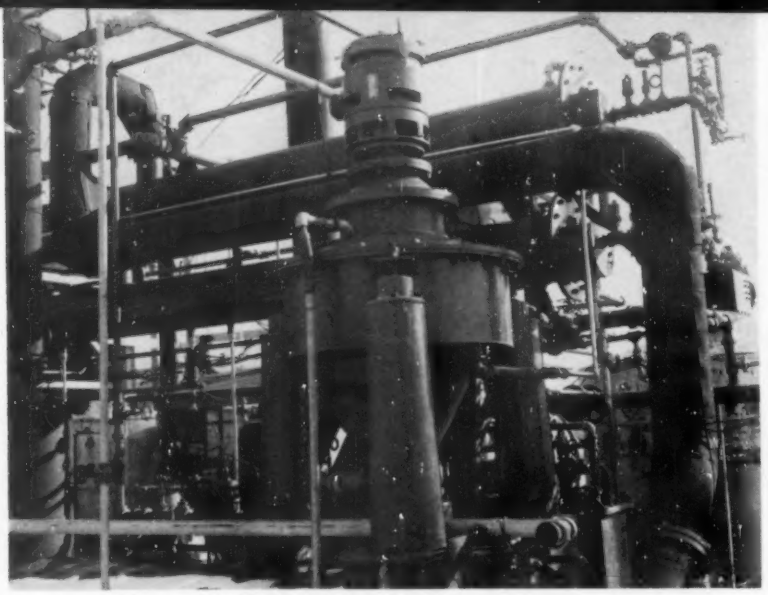
This paper is intended to review the results of a research project which has been carried on since 1951 in an effort to develop a new method of treating sewage sludge. Through the cooperation of the Board of Trustees of the Sanitary District of Rockford, Ill., Henry A. Riedesel, District Engineer, and Dr. N. O. Gunderson of the Rockford Board of Health, an agreement was made to construct and operate a pilot plant at the Rockford Sanitary District. This plant, using the McDonald extraction process, was designed and operated by Aurora Research Industries, Inc., a subsidiary of Barber-Greene Co. of Aurora, Illinois. The principal interest of the Barber-Greene Co. lies in the development and manufacture of material handling equipment including bituminous pavers, ditchers, conveyors and bucket loaders and the object of the subsidiary firm in connection with this project was to explore other fields involving material handling using different techniques than those of the parent company.

A NEW APPROACH and a new type of treatment for sewage sludge is provided in the McDonald Process. Basically it is a solvent extraction process wherein extraction, dehydration, and treatment of raw sludge are accomplished simultaneously. The dehydration was accomplished first by centrifuging and then by distillation. The extraction was accomplished first by centrifuging and then by distillation. The extraction was accomplished by a true countercurrent system using a chlorinated hydrocarbon solvent, while treatment was the result of the effects of the heat and solvent. It should be made clear that this process involves sludge treatment only. It does not eliminate the need for primary clarifiers nor does it eliminate the need for secondary treatment. Sludges of high grease content are easily handled and their chemical and physical characteristics are relatively unimportant. The pH and the presence of normally undesirable compounds such as cyanides, alkalies, or acids do not affect the treatment, although their effect on the end products has not been completely determined. Scum is easily handled and can be treated with the sludge. Dehydration of the sludge is entirely within the process, and the resulting by-products are low in moisture.

Because the McDonald process is accomplished in a few hours, the necessity for large sludge holding facilities is avoided and the amount of space required is greatly reduced. The pilot plant was designed to handle one third of the Rockford sludge output which totaled about 45,000 gal. per day. The pilot plant was completely housed in a 50 x 50-foot building.

Other sought-after advantages were in the returns from the by-products which the process produces. These by-products are the dried, extracted solids and the oils, fats, and greases which are removed from the sludge by the solvent. In 1951, the grease market was at a high level and the extracted material, or black fat, would have brought a price of 1½ or 2¢ a pound. Since one-third of the weight of the dried solids was extracted from the Rockford sludge, this would have been a significant return. It was also felt that the dried solids, or meal, would bring returns as a fertilizer or soil conditioner. Being sterile and low in grease, this material is a more desirable product than the conventionally digested and dried sludge.

When considering the advantages of this process one cannot overlook the intangible benefits it has, although these values are admittedly difficult to sell commercially. The need for returning to the soil the nutritive values found in sewage sludge is recognized by advocates of soil conservation. Because of the improved physical characteristics of the dried solids from the McDonald process, the use of this material is simplified. Grinding or further processing is not necessary,



● **CENTRIFUGE was used to increase sludge concentration by removing excess water.**

and the meal can be spread easily on lawns, gardens, or fields. The elimination of objectionable odors which usually accompany sludge drying systems is also a benefit. This is a result of an entirely closed system with the sludge not being exposed to the atmosphere until treatment has been completed.

Description of Process

The solvent which was used in accomplishing the extraction is one of the chlorinated hydrocarbons C_2C1_4, commonly called perchloroethylene, though a more accurate chemical description of it is tetrachloroethylene. It has a molecular weight of 165.85; it boils at 250.2°F and has a steam distillation point of 189.9 degrees F. The solvent-water ratio is 5.32 by weight; and the latent heat of vaporization 90 Btu/lb. Specific gravity is 1.623 at 20°C and the solubility in water is 0.015 gm/100 gm.

This solvent is non-flammable, very slightly soluble in water, and has a low specific heat, latent heat, and solvent-water ratio. These are important factors in the cost of insurance, solvent replacement, and heat requirement. However, it has disadvantages also, being relatively expensive, quite heavy, and rather corrosive under certain conditions. These factors contribute to the cost of the process by necessitating elaborate solvent recovery apparatus, and corrosion resistant metals.

In considering the McDonald extraction process as it is applied to the treatment of sewage sludge, it is convenient to think in terms of two complete cycles. One of these involves the progress of the non-extractible material.

The raw sewage solids are first concentrated in a conventional manner to reduce the amount of liquid which must be handled. The concentrated sludge is pumped into one of two tanks which alternately supply sludge to the plant. While one tank is being emptied, the contents of the other is being heated to approximately 150°F by the use of low pressure steam or condenser water. The heated sludge is then fed through a metering pump into a pipe line where it is mixed with clean solvent which is also metered into the line. This mixture of sludge and solvent is then fed into the centrifuge.

The purpose of the centrifuge is to increase further the concentration of the sludge by the removal of as much of the water as possible, thereby reducing the amount of water which must be evaporated. The centrifuge discharges two distinct materials. That discharged to the dehydrator consists of the majority of the solids and solvent plus some water. The other is composed of most of the water, solids too small to separate readily in the centrifuge and a small amount of entrained solvent which is recovered by a vacuum process.

The bulk of the solids and solvent discharged to the dehydrator are subjected to a temperature of about 215°F. This causes most of the water in the mixture to be vaporized together with some solvent. The extractible material is dissolved in the solvent and the resultant solution is called a "miscella" the non-extractible material suspended in the bath of boiling miscella is removed and compacted. The meal is then passed into the dryer where, by further application of heat, the remainder of the solvent is removed. Due to the difficulty in removing the final traces of solvent, sparging steam is used. The final moisture content of the meal is also adjusted by means of this steam. This is done to reduce the difficulty which is inherent in handling a completely dehydrated meal. The final meal is dry, fibrous, and resembles the discharge from a vacuum cleaner. This completes the cycle which involves the meal.

The extractible material in solution in the solvent, is drawn from the opposite end of the dehydrator from which the meal is skimmed. Due to the violent thermal agitation in the dehydrator, the withdrawn miscella contains a relatively large amount of suspended solids. Therefore it must be filtered in order to avoid frequent cleaning of the distillation equipment. The filter which was used in Rockford was a rotary vacuum filter of the completely enclosed type. Due to the large percentage of extremely fine particles in the miscella, it was necessary to use a precoat of diatomaceous earth to avoid frequent replacement of the filter medium. About 0.0015 inch of the precoat is removed during each revolution of the drum, thus providing a clean filtering surface during each revolution. Since the filtering surface picks up only the fine particles, a flow of miscella is maintained through the filter and back into the dehydrator. This serves to prevent the buildup in concentration of the coarse solid material in the filter. The fine particles and the precoat material which are scraped from the filter drum are introduced to the dryer by a screw conveyor. There they are processed in the manner which was previously described for the non-extractible material.

The filtered miscella is then pumped to the stills where the concentration of dissolved solids is increased from about 2 percent to 95 percent. The concentrated extractible solids are then dropped into a packed column where they trickle over the surface porcelain Raschig rings. The combination of the large surface area, added heat, and live steam which is introduced countercurrently to the flow of the fat, removes the final traces of the solvent. This product, the "black fat", is then pumped to storage.

This covers the paths of the two types of material through the process. In addition, however, solvent and water vapor are continually being cycled within the plant. The solvent vapor from the stills is passed through the dehydrator where it furnishes the solvent phase

of the azeotrope vapor, thus decreasing the overall heat load. The solvent and water vapor from the dryer, stripping column, and dehydrator, are condensed in a tube and shell type heat exchanger. The resultant mixture of solvent and water is then separated in a gravity separator. The solvent vapor which is drawn from the filter and the flash chamber by the vacuum pumps is condensed before reaching the pumps in order to reduce the capacity requirement of the pumping units.

The system is maintained under a slight vacuum at all times by withdrawing non-condensibles from the equipment through a blower which is attached to the discharge end of the condenser. This vacuum, although only about 1 inch of mercury in magnitude, helps to reduce solvent losses by preventing the buildup of a positive pressure in the system. In order to prevent solvent loss in the vapor passed through the blower it is first passed through a bed of activated carbon which adsorbs the solvent. This activated carbon is regenerated periodically by the action of live steam which forms a solvent—water vapor. This vapor is condensed and the solvent reclaimed. Two beds of carbon are used so that one can be in operation while the other is being regenerated.

Mechanical Details

The plant is installed on a concrete slab about fifty feet square. A frame building was built around the unit during the first winter of operation. In order to clear the equipment, about 23 feet of headroom is provided. There are four 2000-gallon vertical storage tanks for fuel oil, solvent and sludge storage and one 1000-gallon horizontal tank for black fat. Steam for the process is provided by a 150 hp Cleaver Brooks steam generator. Means are provided to heat the black fat to maintain it in a fluid state, and to heat the sludge for the purpose of heat reclamation. The sludge tanks also contain agitators which keep the raw sludge as homogeneous as possible.

The centrifuge is of the bowl type, with a 30-in. rotor operating at 1200 rpm. This subjects the sludge-solvent mixture to a centrifugal force approximately 600 times that of gravity. The dehydrator is 22 feet long, 36 inches in diameter, and steam jacketed. It contains a ribbon flight which revolves at about 1 rpm to reduce solid material accumulation.

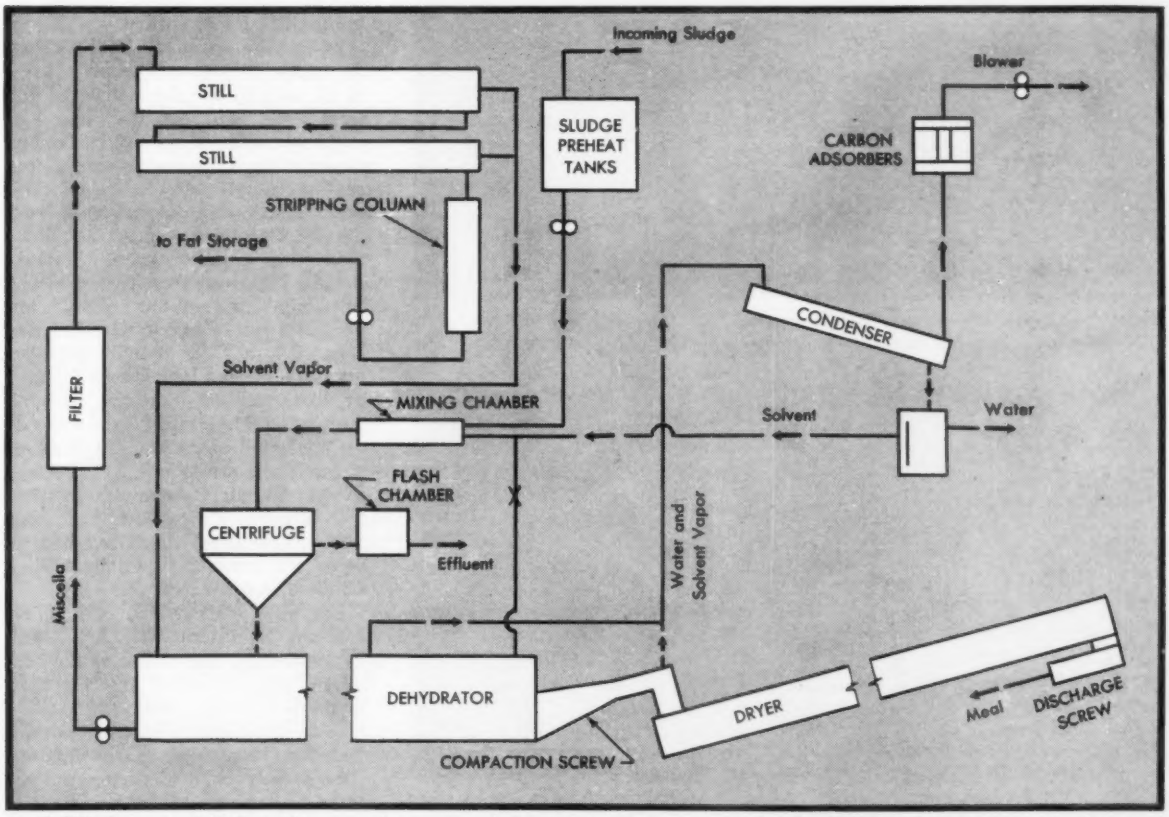
The compaction screw is conical, gradually decreasing in pitch and in diameter from 36 inches to 8 inches. The dryer is 24 feet long and steam jacketed. It contains a ribbon flight which serves to agitate the material and to move it up the twenty-degree inclination of the dryer to the discharge end. The dry extracted solids are removed from the system through a solid screw. This maintains a plug of material in order to isolate the system from the atmosphere.

The filter is a rotary vacuum Oliver with a drum three feet in diameter and four feet long. About 50 percent of the available 36 square feet of filtration surface is in use at any one time. The distillation equipment is composed of two 20-foot units. One of these is 16 inches in diameter and the other 12. The miscella passes through these two stills in series. The stripping column is 10 feet long and 10 inches in diameter. It is filled with porcelain Raschig rings, steam jacketed, and furnished with live stripping steam.

Test Data

A considerable amount of laboratory work was done in connection with plant operation. Samples were

(*Continued on page* 210)



● **FLOW diagram of McDonald process for sewage sludge treatment to recover valuable elements in the sludge and reduce cost.**

MODERN LIGHTING for SHOPPING CENTERS

● **SHOPPING CENTER** patrons appreciate the lack of shadows and elimination of glare. Hutzler Bros. parking lot in Towson, Md., has 72 mercury vapor luminaires.

● **DAYTIME VIEW** of parking lot shown above. The 21-acre area, with spaces for 2100 cars, is lighted with 20,000 lumen lamps spaced 75 ft. apart on 28-ft. poles.

● **WOODSIDE** shopping center, Redwood City, California, is lighted with ten GE fluorescent luminaires. Visibility is good; shadows and dark corners are eliminated.

PERHAPS the biggest attraction for customers that a shopping center can have is an ample, well-lighted parking area—granted, of course, that the quality of merchandise, convenience and shopping service are good. Here are some elements in lighting design based on recommendations in GE Booklet GEA 6438.

At night, both lighting and fixtures should be attractive and inviting; by day, both fixtures and standards should harmonize in color and design with the surroundings. Standards for mounting luminaires may be steel, aluminum or concrete; or fabricated steel towers can be used for floodlights. The overcrowded effect that may result from the appearance of a forest of poles can be avoided by spacing the poles in pleasing proportion, utilizing the correct lamps to give a suitable illumination level, without glare.

In parking areas, where there may be much movement, persons need to be able to see the nature of objects, even against a background of moving traffic; therefore, a higher illumination level is necessary. This should range up from 0.5 foot-candle, with allowance for normal lamp depreciation and for loss of light from dirt accumulations on luminaires. Light uniformity, in terms of horizontal illumination, should not exceed a rate of maximum illumination of 4 to 1 for heavily traveled areas. Glare can be reduced by care in location and mounting heights and by aiming so that light will not be projected along normal lines of sight. There are color differences between mercury vapor, fluorescent and filament lights, but these differences do affect visibility when an equal amount of light, similarly distributed is provided.

For spectacular effects in shopping centers, the illumination level may be unusually high; special lighting effects may be used; lighting may emanate from tall floodlighting towers; or ultramodern luminaires may be used. In any event, the lighting should attract customers, protect them from accidents, and reduce the chances of car damage or theft.

● **NIGHT** view of 1,000-car parking lot at Reding Shopping Center, Oklahoma City, Okla. This parking lot is lighted by 36 GE Form 206 fluorescent luminaires. The good lighting provided is essential for successful operation of shopping centers during nighttime hours.

● **FLUORESCENTS** are used also at the Ritchie Highway Shopping Center in a suburb of Baltimore. Note the well-lighted appearance of the entire area and compare it with the daytime view of the same parking lot, as shown below.

● **DAYTIME** view of the Ritchie Highway Shopping Center parking lot shown above at night. The lights are Form 206 GE fluorescents, mounted on poles which are attractive and help bring in customers in daytime or at night. Note that center poles mount twin luminaires.

● **FILAMENT** luminaires mounted radially floodlight sidewalks and crosswalks of the parking lot at a Stonestown, California, shopping center. The center covers 42 acres. Light source for this photo: GE L-69 flood lights.

Flush Deck Swimming Pools...

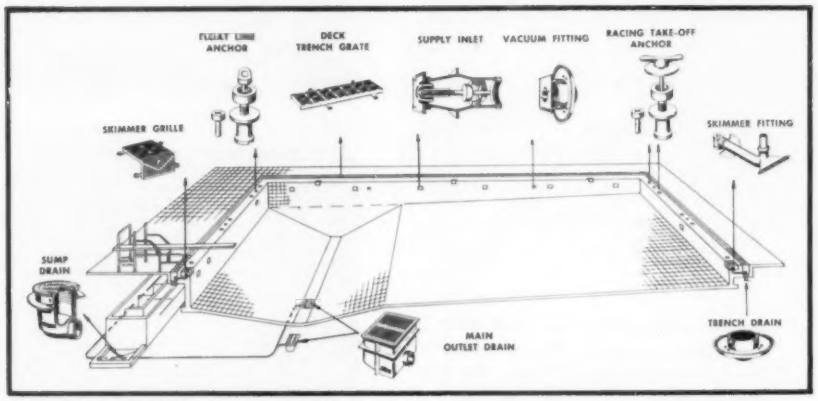
IN AN EFFORT to devise a swimming pool that would provide a higher degree of sanitation and would cost less for both construction and operation, W. F. Campbell, Director of the Boys' Club of America, and the Engineering Department of the Josam Mfg. Co., have developed a new design of swimming pool. This is the "water level deck pool," so called because the water in these pools reaches nearly to the top edge.

Water level deck pools have eliminated the problem of providing for water overflowing to scum gutters. The overflow gutter has been located in a recessed section of the deck or walk way that surrounds the pool. All sides of this deck are pitched to the gutter. The gutter encircles the entire pool and is covered with a grille that traps the overflow and carries it away. With this arrangement, it is impossible for any water overflowing the pool edge to return to the pool until it has been treated.

Another innovation of the water level deck pool aids in attaining maximum cleanliness. The scum that floats on the surface of many pools is mainly composed of accumulated body oils, lint and dust. The flush deck pool is kept free from surface scum by a series of skimmers that are placed at intervals around the perimeter. Skimmers can be adjusted to the desired water level. When the skimmers are set at this level, the entrance of the recirculating water creates a constant flow across the skimmers at the surface of the pool. With this flow all scum is carried into the skimmers. The skimmers are set when no one is using the pool. As swimmers enter, the water level is raised, and the rate of flow through the skimmers is increased. Thus, even when the pool is crowded, its surface is kept clear and sparkling.

Preventing Water Waste

In planning the relocation of the overflow gutter in the deck and the system of skimmers, the designers of the water level deck pool considered another important factor. The water overflowing the scum gutter of the conventional pool continues to the sewer. This wasted water, which had been heated and treated, represented a financial loss.



● **SECTION through typical water level deck swimming pool installation, showing deck drain trench, the fittings and the balancing tank for overflow water.**

Provisions were, therefore, made for the installation of a reservoir which receives any water passing over the skimmers or into the deck trench. The reservoir stores this water until it can be refiltered and returned to the pool.

The swimmer who visits a water level deck pool for the first time will immediately notice the difference, for there are no ladders, no handrails and no steps leading into and out of the pool. Instead, the water fills the pool to about a half of an inch below the deck's edge. Due to the natural buoyancy of the human body at this level anyone can easily roll out of the pool onto the deck. Swimmers can leave the pool at any point along the edge without traveling to steps or rails.

A secondary benefit for the builder of a water level deck pool has been derived through its unusual design. Because the water level approaches the deck, the overall depth of the pool is less than the sidewall gutter type. The amount of concrete and labor for construction, therefore, is reduced, and the cost for many of the fittings normally used is also eliminated.

● **GETTING out of the water level deck pool is easy because water reaches to the top edge of the pool. Overflow water enters grill shown just back from edge.**

● **NEW SEWAGE treatment plant at Sacramento, located near a residential area, is attractively designed and well operated.**

SEWAGE PLANT

is attractive Community Enterprise

LOCATED in a beautiful residential area, the new sewage treatment plant of the City of Sacramento, Calif., is proof that a modern sewage treatment plant can be designed, built and operated as an attractive asset to the community. The final disposal point of the treated sewage is the Sacramento River, and increased recreational use of the river with influx of industry and higher population density necessitated the construction of treatment facilities.

The plant is designed to handle an average dry weather flow of 54 mgd. The city sewer system is of the combined storm and sanitary type, with maximum storm flows reaching a 400 mgd rate, but only 70 mgd is handled through the plant under these conditions. The average flow at the present time is 48 mgd, with a minimum rate of 30 mgd. From August to November, 1955, 25 to 30 percent of the solids load in the sewage was cannery plant waste.

Briefly, the plant involves pre-chlorination, grit removal and washing, comminution of fine solids, pre-aeration, settling and post chlorination. Sludge from the settling tanks is digested, elutriated, flocculated and dewatered on vacuum filters.

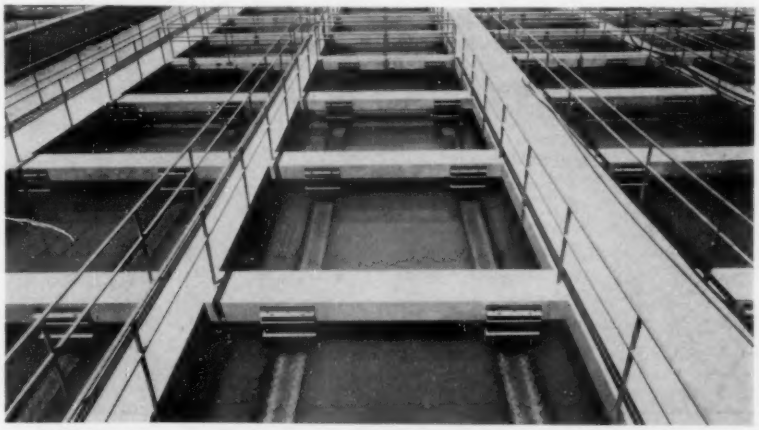
After pre-chlorination for odor control, the sewage passes through four grit chambers each 12 ft. wide, 4 ft. 11 in. maximum water depth by 75 ft. long. Parshall flumes and flow metering equipment are used for automatic control of the number of chambers in operation. Thus flow velocities through the chambers are kept within desirable limits.

Each grit chamber is equipped with a double strand combination type chain and steel flight grit collector operating at a speed of 8 fpm. Each collector delivers the grit into the hopper of an inclined 12-in. diameter washing and dewatering screw. An adjustable baffle over each screw deflects flow downward in such a way that organic matter is washed out of the grit. A 1½-hp Link-Belt Electrofluid drive is used on each grit collector and a 1½-hp standard motor drive is used on each dewatering screw.

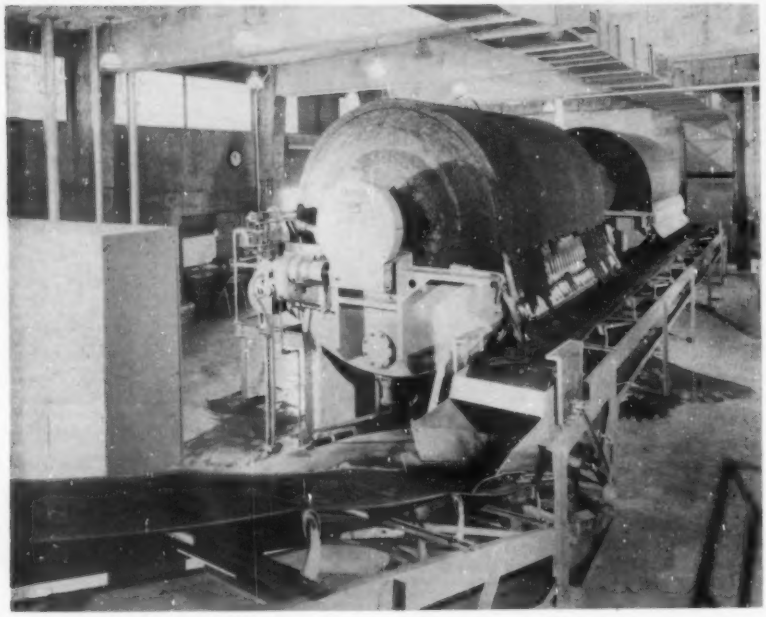
A 12-in. diameter horizontal screw conveyor collects grit from each of the four dewatering screws and delivers it into a dump truck. The grit equipment is time-clock operated 20 minutes each hour, and approximately 0.4 cu. ft. of grit is removed per mgd of sewage.

Pre-aeration and Settling

After passing through the grit chambers, the sewage flows through comminution equipment to shred any large floating suspended solids, and it then enters ten combination aeration-settling tanks. Each aeration-settling tank is 37 ft. wide by 11 ft. average water depth by about 244 ft. long. The initial 47 ft. of each tank are used for aeration purposes, and based on the average design flow, the aeration period is about 50



● **THERE are ten aeration-settling tanks, each 244 ft. long, with the initial 47 ft. of each tank used for aeration. Aeration is 50 mins., and settling time is 3 hours.**



● **FOLLOWING elutriation, two vacuum filters dewater the sludge to about 67 percent moisture. Dewatered sludge goes by belt conveyors to sludge storage hoppers.**

minutes. The remaining portion of the tank provides a settling period of approximately three hours and 15 minutes.

In each tank there are two longitudinal Link-Belt "Straightline" sludge collectors that convey the settled solids from the entire length of the tank to a cross sludge collector at the effluent end of the tank. Each sludge collector consists of a double strand of 730 Promal chain with 3-in. redwood flights on 10-ft. centers for the long collectors and 5-ft. centers for the cross collectors.

Speed of the collector flights can be readily varied between one and three feet per minute. A single drive assembly for each set of collectors in each tank consists of a Link-Belt PIV motorized positive, infinitely variable speed drive direct connected to a helical worm gear reducer. The output shaft of the reducer is extended to drive a countershaft through a bevel gear set. A pintle chain drive with a clutched drive sprocket is used between the drive assembly and the head shaft of each sludge collector.

The sludge collectors in the aeration-settling tanks are operated continuously, and sludge pumping is controlled over a fixed time schedule. Water sprays are used to float the scum to one corner of the tank where a Link-Belt rotary skimmer is used to take it to the receiving trough.

Approximately 0.1 cu. ft. of air is applied per gallon of sewage, and the aeration-settling tank effluent averages 4 ppm dissolved oxygen. Thus excellent conditions are maintained in the settling tanks at all times. As a final precaution the effluent is chlorinated to provide a residual of about 0.2 ppm of chlorine before discharge into the Sacramento River. Chlorine dosage is actually controlled by making coliform count tests on the plant effluent.

Sludge Disposal

Sludge from the aeration-settling tanks is pumped to five circular digesters, each of 1½ million gallons capacity. The digesters are designed to operate as three primary and two secondary units. At the present time all are used as primary units due to the below-capacity solids loading.

● **GRIT collector operation is controlled by flow measuring equipment.**

Digested sludge is withdrawn from the bottom of the digesters and elutriated, that is, washed before dewatering on a vacuum filter. In the elutriation process digested sludge is mixed with plant effluent in the ratio of 160 gpm to 480 gpm, and the mixture is passed through a settling tank 27 ft. wide by 10 ft. deep by 60 ft. long. This tank is equipped with two longitudinal and one cross sludge collectors operated also by a single drive unit. The speed of these collectors is two feet per minute and the drive assembly is similar to that for the aeration-settling tanks except that an Electrofluid drive unit is used in place of the PIV drive.

Settled sludge from the primary elutriation tank is pumped to a secondary elutriation tank 13 ft. wide by 10 ft. deep by 60 ft. long. The sludge is either recycled for a second wash with plant effluent or it is pumped to the vacuum filter system in the filter building. Ferric chloride is added to flocculate the elutriated sludge to condition it for dewatering on either of the two vacuum filters. Filtering operations at the present time require only a single shift five days a week. Ferric chloride dosage amounts to about 2½ percent on a dry solids basis, and the solids content of the sludge as pumped to the filters amounts to 8 or 9 percent.

The vacuum filter cake contains approximately 67 percent moisture, and the filter discharge is collected on a 24-in. wide horizontal troughed belt conveyor. The horizontal belt discharges onto an inclined troughed belt which in turn feeds to a flat distributing belt arranged at a right angle to the others. The distributing belt is located over nine sludge storage bins; air-operated "V"-shaped plows are used to discharge the sludge into the proper bin. The distributing belt can be reversed to discharge the sludge onto a troughed shuttle belt, designed to deliver sludge to railroad cars on the adjacent siding. Each of the above storage bins is equipped with special drop bottom gates to facilitate discharge of sludge into trucks. Each of the conveyors is driven by a 1-hp Link-Belt Gearmotor and roller chain drive; idlers are Link-Belt Series 90, and all chutes are lined with stainless steel sheet.

The city park department uses large quantities of the "soil conditioner" for their park and playing field facilities. The city has a liberal

give-away program to residents of the area for home garden use.

Because of the nearness to the highly residential area, the emphasis is on good operation and cleanliness throughout the plant. Excellent facilities have been provided for administrative, laboratory and worker personnel and for maintenance operation at the plant.

The plant was designed and built under the direction of the Engineering Office of Clyde C. Kennedy, Consulting Engineers with W. E. Shaw as Project Engineer. E. A. Fairbairn is the City Engineer with Carl Jennings as his assistant. Operation of the plant is part of the function of the City Water and Sewage Division. R. W. Jones has charge of this division with Harold Jeffrey as Superintendent of the sewage treatment plant. Laboratory control work on plant operation and river conditions is performed by Elmer Herr, Assistant Plant Superintendent and Chemist. The construction contractor was the Stolte-Early Jr. Company of San Francisco, California.

Link-Belt Company's San Francisco plant furnished the grit collectors, sludge collectors, rotary skimming equipment, drives and also the belt conveyor system for handling the dewatered sludge.

The HIGHWAY LITTERBUG Costs Millions

GUY BROWNING ARTHUR

SOME TIME AGO a prominent organization announced that we are spending $5,000,000 every year to clean up litter along the highways. That is about $100,000 for each state. This figure is far short of the probable cost of trailing the litterbug. And it suggests nothing of the broader aspects of the problem which this character drops on the doorstep of every highway department.

Through this summer a survey was made of conditions and practices in the southern tier of states: South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana and Texas. Northern states have the litter problem through the summer, but these southern states have it the year round.

It used to be that vacationers came south only in the winter, but in latter years they have discovered that temperatures are no higher in the beach states than in northern resorts, and that for much of the summer they are lower. So the volume of tourist travel in the summer is almost as heavy as in the winter. What is done by highway departments in these states, and their thinking about litter collection, is a fair run-down on the problem for the whole country.

Even in this tier of states, where it would seem that the litter load would be uniform, there are surprising variations. In Louisiana, for example, there is more litter in summer than in winter, and more of it is left by local people than by tourists. The volume of beer cans near fishing camps and along shores is astonishing. Louisiana does not promote its attractions for tourists and vacationers from outside the state as vigorously as other states do. Its own people are ardent fishermen, and the fishing places are beyond counting.

Cost figures have not revealed very much in these states, chiefly because litter costs are not separated from other figures. But to indicate the scope of the problem, South Carolina is spending at least a quarter of a million dollars each year to remove litter. Machine mowing alone, which is inseparable from

● **SIGN IN South Carolina means what it says. The law is enforced there and offenders are fined. As a result, cost of keeping roadsides clean is much reduced.**

litter removal, cost $335,395.58 for the fiscal year 1954-55. The total bill is well over half a million dollars. South Carolina is not a big state. If costs run about the same the total for an area like Texas would be staggering.

Louisiana spent $110,000 for picking up trash along the highways in 11 months last year, and thinks this is so high that any other method will get attention. It is fortunate in having its cost so low. If it were overrun by out-of-state people, as other states bordering salt water are, the figure would be many times higher.

Picking Up Litter

No operation that we see along well-kept highways is as disconcerting as crews of men walking along road shoulders picking up scraps of paper, beer cans, and paper sacks of picnic waste. It is the antithesis of the efficiency and dispatch in other uses of manpower for highway work. Able-bodied men following a litter truck, throwing scraps and rubbish into it from time to time! We see it in every state.

In Louisiana the crews carry sacks or hampers, and pick up litter regularly on Fridays and Mondays near cities. Other areas are covered as often as may be necessary to keep the shoulders reasonably clean. The accumulation is hauled off and burned, and it is becoming so voluminous that places may have to be leased for disposal. A great deal of packing paper is found in piles where trucks returning from cities have been cleaned out. Much paper was blown off uncovered vehicles, but now a new law requires covers for all trucks carrying material that may blow.

The other states collect litter in about the same way, on regular or occasional schedules.

E. A. Landry, Maintenance and Construction Engineer in Louisiana, adds one telling figure to the score. He counted 200 beer cans on his side of a short stretch of road coming out of a fishing camp.

Every highway department in these southern states would like to find some way to eliminate this wasteful and expensive business of picking up litter. The increasing futility of this kind of highway housekeeping impels thinking toward any more effective method, such as concentrating at advertised deposit stations.

Trash-Can Experience

Florida led with a trash-can program about 18 months ago. It was expected that when the public saw that deposit stations had been established, every car would save its waste until one of these stations was reached.

Beautiful new signs were made. Turnouts were built about five miles apart. At some distance from the turnout a big green sign reads: "Trash Can Ahead." At the approach side of the turnout there is a similar sign. No one can fail to see both signs. The sparkling new can, done in the same colors, stands on the outside of the turnout, close enough for dropping waste into it from the car window. The turnout is long enough to permit of turning off the pavement without slowing traffic.

Careful planning has perfected a combination of cans, turnouts and signs that can scarcely be excelled. Everything has been done to invite the cooperation of travelers in keeping the highways clean. The same provisions have been carried into roadside picnic spots, so the system is uniform throughout the length of the highway.

Pick-up trucks were scheduled to serve sections of the roads, most frequently after week-ends, collecting the waste and hauling it off to dumping or burning places.

An outsider would expect to lose his faith in the instincts and decency of the public if this elaborate and comprehensively planned scheme didn't work. It reflects credit on the highway department and the maintenance staff.

But those who watched the experiment had a most disheartening setback. Some cars pull off at the turnouts and drop their bags of waste into the cans. More do not. It is still common to see paper and fruit waste thrown out of cars as they hurtle along at top speed, to light where it may. It is still necessary to pick up litter along the road shoulders. The attractive signs and trash cans may stimulate more thinking about civic pride, and restrain more and more people from dropping their waste until they reach a turnout. That should be a cumulative result.

But the most discouraging outcome is that the scheme makes the

● **FLORIDA: Every five miles there is a turnout and trash can. Pick-up trucks collect on regular schedule.**

● **GEORGIA: Law is not regularly enforced so signs such as this one have little effect on most litterbugs.**

● SHORT lengths of chain suspended along front of rotary motors reduce hazards due to flying beer cans.

● TYPICAL well-kept roadside area in Florida. The cans are painted in same manner as those at turnouts.

highway department a garbage collecting agency for all the householders along the road. What they did with their waste and garbage before the trash cans were placed in the turnouts is mere conjecture. They may have buried it or burned it. But now they find it so much easier to drop everything into the highway department's beautiful green cans that this practice has become quite the custom.

An editorial in a Jacksonville paper plays up a new individual. It says: "an unexpected figure invaded the picture—the lazy garbagebug. Residents living near these turnouts saw an easy inexpensive way to dispose of their garbage. Pile it in the cans and the state would haul it away free.

"The program was never intended for this purpose, and the garbagebugs are about to break the system down. Cans are not large enough and pickups not frequent enough to cope with the mass of garbage that has descended."

Louisiana had a similar experience, but by accident. At a crossing where a road turns off into an exclusive suburb there was a big sign. A few piles of trash which had accumulated behind the sign were hauled away by maintenance crews. More piles, plus garbage, were then dropped there, and the crews still hauled them away. The piles grew bigger and bigger. At last the Highway Department put up a sign saying that no more stuff would be hauled away. The people in the big houses were highly indignant.

This state has another kind of trouble, which may be shared by other states along the Gulf of Mexico. When seafood waste is left for a few hours it smells to high heaven. Fish heads and entrails, shrimp cleanings, crab shells and whatnot accumulate at every camp and at private homes, mostly over weekends. People don't want the stuff smelling in their garbage pails over Sunday, until it is collected on Monday. So they sneak it out to the highway and leave it there. By the time highway crews reach it, it is a mess.

Laws, Signs, and Penalties

Every state has signs warning that litter must not be deposited along the roads. Every highway department admits that unless the law is enforced the signs mean exactly nothing. To add on the sign that the penalty is $1 or $1000 adds nothing to its effectiveness. In all states but one, the signs are merely additional hazards along the road. They had better be taken down.

South Carolina is the exception. There the maintenance department operates the State Highway Patrol. In this one state the responsibility for keeping the highways clean is coupled with responsibility for keeping them safe.

In such a coupling of authority there is genuine enforcement of the warning: "Violators Will Be Prosecuted." The patrolmen make cases against offenders. During the period from July 1 to December 31, 1955, patrolmen issued 65 warnings to violators, and made 26 cases. They obtained a conviction in every case.

In this one state enforcement puts teeth in the law. The fine may be as much as $100, or the violator may be imprisoned for 30 days. In Georgia the sign says the penalty may be $1000, but the highway department has no record of a prosecution. Texas says: "It is very difficult to enforce the law, and just the erection of signs warning the public does not prevent dumping of waste."

In Mississippi a law is pending which makes dropping of waste along the highway a misdemeanor, and provides a maximum fine of $100 plus the cost of removing the litter from the highway. If this is enforced it will make a good example for other states. It might be still more effective if it compelled the offender to remove the waste.

Outside this southern tier of states, Indiana and California charge local and state police with enforcing litter laws. Fines range from one dollar in Kentucky through a wide assortment. No other state has its fine as high as the $1000 in Georgia.

There is complete agreement that unless there is specific provision for catching and prosecuting offenders, all the signs that can be erected will only obstruct the view.

Mowing Shoulders

Mowing, standing alone, may not seem to be a part of the litter job. In actual practice it cannot be separated from it.

Rotary mowers handle ordinary litter, and somehow even bottles, safely, but they throw beer cans. If the cans could be picked up, or raked up, ahead of the mower the trouble would be eliminated, but that would mean another operation and additional expense.

In most states a screen of short lengths of chain is suspended at the front of the mowers, but this does not stop all cans. Alabama found it necessary to run a piece of stiff wire through all the chains at about midway of their length, to make

them act together. But it takes the extra precaution of having the mowers run only in the direction of traffic, and even stops mowers when groups of cars are passing. Several cases of serious injury to persons have been reported, and scores of minor cases. Louisiana has five or six a week.

Educating the Public

Through all the discussions with highway departments there runs the idea that only by educating the public can we expect to solve the litter problem. Yet no highway department has organized or pushed such a program. The only effort has been made by outside organizations.

The best case is in Louisiana. The governor called a meeting of all women's organizations about two years ago, and asked them to form a federation to combat the litter nuisance. The federation is still active, and has done a great deal of good. When one of the maintenance men sees rubbish thrown out he sends the license number of the car to the nearest women's organization. The president of the club writes a courteous letter to the owner of the vehicle, calling attention to the effort to keep the highways clean, and soliciting his support. The effect is almost always good.

But the women unwittingly broke out a new problem for the highway department. They persuaded the petroleum companies to place trash cans at all filling stations. When the time came to collect the trash from these cans the highway department looked over the situation with a critical eye and decided that it could not haul the trash away. If it did it would become a trash collecting agency, which is not one of its duties prescribed by law.

The public couldn't understand that. It asked why the department wasn't willing to do something to promote the state campaign to stop the litterbug. Would it not even haul the rubbish away, after the women had arranged for the trash cans? Isn't the department interested?

Without the work of the women's federation, trash collection along Louisiana highways would be costing much more than it is costing now. The work of the federation may be the factor which holds the present cost down to about $120,000 a year.

The taxpayer pays the bill, of course. If he knew, in Mississippi, that the cost of removing litter is about 11 percent of the total cost of highway maintenance, he might be more careful in disposing of his litter. Or if a person in South Carolina should stop to think that he is spending well over half a million dollars a year to keep his roads clean, he might think twice about heaving his beer can out of the car window.

It is easy to say that we must educate the public. But the public doesn't educate easily. In scarcely anything else do we see the thoughtlessness and perversity exhibited toward public property. We demand more highways, and abuse them with reckless abandon. We scarcely think of them as beautifully landscaped avenues through the country. It may be that highway departments will have to accept highway housekeeping altogether, as part of their jobs. At present it seems that we must induce civic organizations to beat the drums and get something done about litter problems.

It may be desirable from a legal standpoint, for making laws, to frame a definition for litter. But for practical purposes, ahead of new laws, the common objective is to find ways to stop littering the road shoulders. It is a paradox to build fine thoroughfares and then make them look like the fringes of a garbage dump. Our esthetic sense rebels at that.

The experience of Florida with trash cans raises serious doubts about the efficacy of that solution. The public is too willing to make the highway department a garbage collecting agency.

We can force people to obey laws which insure safety for persons, property and business. We have tried enough experiments in compelling people to surrender their views in other directions to know that it doesn't work. We may be able to show the public that it should respect our desire to have trim road shoulders, and that an unsightly highway is not a good highway. How to do that is still to be discovered. Unless we find ways to implement the efforts of civic organizations, these organizations cannot do effective work and may give up the fight.

Putting up signs that threaten prosecution which never happens is futile. We have so many signs along the highways now that no one pays more than subconscious attention to them. Traffic experts see more hazards in meaningless and conflicting signs than in almost any other factor in highway safety. Only in fixing blame for accidents do the signs become an important factor. Money is ever more needed for highway work, and it is a serious question how much of an appropriation can be diverted from urgent construction to the enforcement of litter laws.

● **HIGHLY visible sign along Florida roadside. The system of signs, trash cans and turnouts was planned carefully.**

● **THIS is what the Florida Highway Department hoped all travelers would do; success of the program is still in doubt.**

EQUIPMENT

Replacement

A sound policy for timely replacement keeps New York's sanitation equipment operating efficiently and provides substantial savings

PAUL R. SCREVANE
Commissioner of Sanitation
City of New York

WHEN should equipment be replaced? This question is being given a lot of attention and study by municipalities today. To cope properly with the manifold problems caused by the phenomenal growth in the country's population, it has been necessary to mechanize most of the activities in the field of municipal sanitation for the task has outgrown the capabilities of manual labor. This development, particularly in street cleaning, waste collection and waste disposal has resulted in the acquisition of large and expensive equipment inventories by municipalities. The Department of Sanitation in New York City, for example, has 3,700 pieces of automotive equipment of many types and sizes. In order to maintain these equipment fleets at a high standard of operating efficiency and reliability, a proper program of equipment replacement must be devised and adopted. The setting up of such a program has been influenced by several schools of thought: some based on empirical experience, some on theoretical considerations, others on economic analysis and still others on technological developments. It is the purpose of this article to review the experiences of the Department of Sanitation and to present its method of resolving the question.

Although the following admonition was addressed to industry, it applies equally as well to municipal government: "Look out for paid for equipment that does not cost you anything." Municipalities can no better afford to use obsolete, outmoded, overage, patched-up and inefficient equipment than industry. Those municipalities that have not already done so should set up yardsticks of economic life of equipment for determining replacement times. It must be borne in mind that these standards cannot be rigidly adhered to but must have some flexibility to adjust to complications caused by material shortages, wars, financial depressions and the like.

Taxpayers and their elected representatives take a lot of convincing when it comes to appropriating money for equipment replacement. More glamorous projects such as schools, parks, playgrounds and hospitals get first call on the municipal exchequer. Consequently, strong cases buttressed with all the facts must be presented to show that requested replacements are justified economically and servicewise. Adequate records must be kept giving a complete history of each piece of equipment so that it is not permitted to outlive its usefulness. Such records furnish the necessary support for the request for replacement.

Until recent years the Department of Sanitation did not have a fixed policy of equipment replacement. This condition was brought about by many factors.. During the depression years of the 30's money was not available for such expenditures; during World War II, and the years following, and during the Korean hostilities, there was a shortage of material for civilian use which precluded purchase of new equipment. As a consequence, the deterioration of the equipment fleet had progressed to such a point that the City had to take drastic action, including the alteration of its policy of financing equipment purchases. Up until 1948 such equipment was purchased from the Expense Budget since such items were considered expendable and paid for out of yearly tax levy funds. Because of fund limitations only a few units could be purchased annually. However, the need for refurbishing the equipment fleet was so urgent that the City went all-out in its effort to renew its equipment and, in 1948, began to charge these expenditures against the Capital Budget. Capital Budget items are financed from the sale of bonds or other certificates of indebtedness which are redeemed over a period of years. In 1948 $8,-

Courtesy City Tank Corp.

● **MOST recent addition to New York's refuse collection fleet is typified by this 16-yard Model 516-B Rotopac which is mounted on an International Model 212 truck.**

000,000 was appropriated for new equipment and each year since about $4,000,000. When this program was started in 1948 more than 90 percent of the waste collection equipment was more than seventeen years old and in deplorable condition. Today, as a result of this replacement program most of the fleet is less than 7 years old, which age, our analysis indicates, is the optimum economic life.

Replacement Policy

Our present replacement policy requires that many variables be equated to arrive at the economic life of a piece of equipment. It must be borne in mind that the determination of when the proper time to make replacements has arrived is difficult for there is no easy method of solving the problem; nor is there any magic number or rule of thumb that can be used. For example, the Department's 3,700 pieces of automotive equipment are of many types which are subjected to varying kinds and conditions of services. Some units, such as collection trucks, are in continuous operation, round the clock, while others, like snow loaders, are used only a few days during the year. These differences require that a separate detailed economic analysis be made in each case whether one unit or more units are involved. Included in this analysis are determinations of both operational costs and capital costs of the new versus old units.

The major factors influencing operational costs which must be compared between the new and old units are: 1. Productive capacity of the units; 2. Productivity of labor; 3. Fuel consumption; 4. Maintenance and repair costs; and 5. Reliability of service.

Productive Capacity

Equipment productivity contributes in a major measure to the operational costs and both the proposed and old units should be compared on this basis. It would not be economical to replace equipment on age alone for the factor of higher productive capacity might well control the decision. Reviewing our experience with collection trucks as an example, we find that technological improvements in equipment rather than equipment age dictated much of our truck replacement program. Among the improvements made were the change from the open truck to the closed truck, the addition of mechanical loading to the closed truck, and further addition of compacting

● **MAINTENANCE is essential to keep units in service, since downtime for any appreciable period necessitates rental or standby equipment. This is the repair bay.**

devices to the loading equipment. Each development in turn produced a more productive unit that warranted its purchase and the retirement of the previously owned equipment regardless of the age. Savings in collection costs resulting from the employment of the new trucks which load from 1½ to 2½ times more material than

Principal Equipment Operated by the New York City Department of Sanitation

REFUSE COLLECTION TRUCKS

Type	*Body Manufacturer*	*Chassis*	*On Hand*
Escalator Compactor	City Tank Co.	Int'l Harvester	745
Escalator Compactor	City Tank Co.	I.H. (On order—165)	
Batch Compactor	Garwood	Genl. Motors—Autocar	538
Batch Compactor (Garwood Tailgates)	General Motors	General Motors	101
Open (Junk Collection Trucks)		Autocar—Genl. Motors	74
Removable Containers	Dempster	White	18
Miscellaneous			14
		Total	1,490

STREET CLEANING AUTOMOTIVE EQUIPMENT

Type	*Manufacturer*	*On Hand*
Mechanical Brooms	Wayne	219
Flushers	Int'l Harvester, Autocar, Ward LaFrance	231
Tow Trucks	Ford	101
Miscellaneous		6
	Total	557

SNOW REMOVAL AUTOMOTIVE EQUIPMENT

Type	*Manufacturer*	*On Hand*
Snow Loader (Blower)	Sicard	41
Snow Loader (Blower)	Snogo	61
Crosswalk Tractors	International	572
Snow Loaders (Bucket type)	Nelson	24
Front End Loaders	Pettibone Mulliken	20
Front End Loaders	Trojan	5
Front End Loaders	Hough	6
Salt Spreaders	Highway	30
Salt Spreaders	Good Roads, Highway	97
Salt Spreaders	Tarco	25
Miscellaneous and other		19
	Total	900

● **WHEN collection trucks have ended their useful life, they are remodeled and converted for use in junk collection.**

● **SALVAGED collection truck chasses are also used for other needed purposes. These units are now salt spreaders.**

the outmoded units, combined with the manpower savings because of the lower loading height, amounted to millions of dollars yearly.

In the case of another major piece of equipment—the mechanical street sweeper—the evolution of the modern street sweeper which increased output from 50 to 100 percent dictated its purchase regardless of the age of equipment in service. The new units with their dual control, dual gutter brooms, are able to operate on either right or left curbs in the direction of the vehicular traffic on one-way streets. They have large hoppers obviating frequent trips to the dumping points, and are fitted with cabs so that they can be used throughout the year. New York City has retired all of its obsolete models, has purchased 200 of the new type sweepers and contemplates purchase of 160 more.

In the field of waste disposal, improvements in landfill equipment have never ceased. Crawler type tractor equipment such as bulldozers, cranes and hauling equipment, has grown in size yearly. Productive capacity has increased accordingly. Rubber tired, off-the-road construction equipment is now being used more and more by municipalities. At our Fresh Kills project, the Athey wagons used for hauling have grown in size from 30 cubic yards to 40 to 50 and the latest units are 60 yards capacity. Each train of two units now hauls much more material with the same personnel. Other examples of technological improvements could be cited endlessly, not only in complete units but in parts of units such as torque converters and the like which have changed the equipment factor considerably. Manufacturers, spurred on by competition, are constantly striving to produce more efficient and effective type of equipment for sanitation operations.

LANDFILL EQUIPMENT

Type	Manufacturer	On Hand
Wagons 40-60 yd.	Athey	54
Cranes	Bucyrus Erie, Lorain, Northwest	10
Tractors	Caterpillar	79
Scrapers	Heil, Garwood	18
Trucks	General Motors, Autocar, Int'l Harvester, FWD	52
Graders	Caterpillar	8
Station Wagons	Willys	9
Miscellaneous		12
	Total	242

SUPERVISORY VEHICLES

Type	Manufacturer	On Hand
Passenger Sedans	Buick, Chevrolet, Ford	56
Coupes	Chevrolet, Ford	179
Miscellaneous		7
	Total	242

MAINTENANCE EQUIPMENT — AUTOMOTIVE

Type	Manufacturer	On Hand
Wreckers	FWD, LaFrance	41
Delivery Trucks	Ford	28
Rack Trucks	International Harvester	5
Delivery Trucks	Chevrolet	51
Utility Trucks	Chevrolet	40
Ladder Trucks	GMC	3
Rack Trucks	GMC	15
Truck mounted Welders and Compressors		10
Gasoline Tank Trucks	Autocar	3
Miscellaneous		38
	Total	234
	GRAND TOTAL	3,665

Labor Productivity

The second major item to be evaluated in arriving at the operational cost is the difference in labor productivity of the old versus the proposed units. Communities are faced with the fact that labor costs have increased over the years due to inflation and to the universal adoption of modern labor practices. Included in these practices are the 40-hour week, the prevailing wage

and the many fringe benefits such as more liberal sick leave, pensions and holidays. This rise in labor costs makes it mandatory to acquire the most efficient labor saving equipment, selecting those units which will receive best labor acceptance. Continuous research and development have produced such equipment. One of the outstanding examples is the escalator compactor trucks which can load from 50 to 100 percent more refuse in the same time with the same labor as the old non-compacting or open truck. A collateral benefit which resulted from the use of this modern unit is the reduction in time lost due to injuries to the loaders. Because of its low lift, disabling injuries to personnel have been reduced by as much as 90 percent, further cutting down on labor costs.

The modern mechanical street sweeper does as much work and does it more efficiently and effectively than eight manual sweepers. The motor truck flusher with its high pressure sprays has almost completely displaced the hand hose cart and hand hose reel. Recently the detachable container system for handling bulk refuse is coming into wider usage. This system enables one man to do the work of two in handling refuse from such institutions as hospitals, schools, housing projects and the like. The latest salt spreaders have a capacity of 9 cu. yds., 50 percent greater than the old; and they are equipped with controls in the cab requiring only one man to operate the unit instead of the two in the older models.

Fuel Consumption

The third item of operating expense to be compared is fuel costs. There is little need to belabor this point as the economy of the modern high compression engine has been well established. Modern units, through endless research, are designed to deliver more horsepower more efficiently at the wheels, materially cutting down fuel requirements. Since the fuel and oil bill of the Department of Sanitation amounts to approximately $1,400,000 per year, any increase in fuel consumption efficiency will save appreciable sums.

Maintenance and Repair

The fourth consideration is maintenance and repair costs. Every unit, no matter how well constructed, starts to deteriorate from the first day it is put into service. Its useful life is wholly dependent upon the amount of maintenance and repairs expended upon it. In arriving at its economic life we must decide how much we can afford to spend to keep the unit going. These expenditures must be rigidly controlled in order that inordinate repair costs do not mount up inadvertently. This is particularly true of units that are approaching the end of their economic life for, because of the highly competitive nature of the equipment field, all major parts are engineered to wear out at about the same time.

Maintenance personnel, because of pride in their work, are prone to make all the repairs necessary in their judgment to restore units to satisfactory service. At times this involves considerable rebuilding, the cost of which might more profitably be diverted to the purchase of new equipment. This is especially true in those cases where units have suffered severe damage because of accidents, collisions or fire. A policy should be established for periodic inspections of units after they have passed their half-life mark, usually after three years. These regular inspections will reveal conditions which will determine the proper replacement time whenever maintenance costs control replacement.

In the case of passenger automobiles, the type of service the unit has been put to determines whether age or mileage governs replacement. Cars used by foremen, inspectors and other personnel overseeing operations will usually get the heaviest use and it is not uncommon for mileage to run up to 60,000 to 75,000 miles in a three-year period. On the basis of past experience, cars should be replaced when they reach this mileage. On the other hand, cars used by higher supervisory personnel and officials usually do not reach this mileage and the time factor governs. In these cases about five years has been established by experience as the proper age for replacement. Accurate and complete cost records must be kept on all maintenance and repair work to aid in building up a set of standards on which to base policy.

Reliability of Service

In completing our analysis of operational cost comparisons between old and proposed equipment, we find that the fifth item, reliability of service, plays an important role. There is no question that a new unit after the break-in period is certain to be more dependable than an old unit. When a check is made of the cost of downtime the amount of this item may surprise. Take even a one-hour breakdown of a collection truck, for example. As-

● **COLLECTION and dump cart of the gay nineties. These were the days when manpower and horsepower were dominant.**

● **TWO-HORSEPOWER street flusher. The internal combustion engine appears, however, in the attachment at the rear.**

suming that a unit has a full day's work outlined for it, a breakdown will immobilize the crew, requiring the three men to work an additional hour of overtime and running up a labor cost of approximately $20. In addition, the mechanic's service call and repair costs will have to be included under the Maintenance and Repairs item.

Downtime of any appreciable length will either necessitate rental of equipment or the acquisition of excess stand-by equipment; both are quite costly. Some idea as to rental costs can be gained from New York City's experience in hiring collection trucks during snowstorms when regular personnel are engaged in snow fighting. The rates for truck hire, including a driver, are as follows: 10-yd. truck $7.10 per hour; 12 to 14-yd. truck $8.33 an hour; 14 to 16-yd. truck $9.45 per hour; 16 to 18-yd. truck $11.43 an hour. These rates apply only during the regular eight-hour day shift; overtime, Sundays and holidays increase them. Records should show the downtime history of each piece of equipment so that its probable performance can be estimated.

Striking a balance of the five major items listed above, we arrive at a fairly reliable estimate of the total operational costs of the existing units and the proposed new units. There are some further miscellaneous items such as insurance, etc., but these will not have much effect on the comparison.

Capital Costs and Fixed Charges

On the reverse side of the coin we have the economic analysis of capital costs and the fixed charges between the present units and the proposed units. They fall into three categories: Depreciation; Interest; and Rehabilitation.

1—*Depreciation.* The first item, depreciation, can be computed in several ways. Depreciation is due to either physical changes such as wear and tear and the action of the elements or functional changes which render existing equipment obsolete or inadequate. Depreciation can be computed on a straight line basis or on a production basis. In the first case the trade-in or salvage value of the equipment at the end of the economic life is subtracted from the initial cost and it is divided by the number of years of useful life, giving the yearly depreciation cost. This method is applicable to units where age is the controlling factor. Another method in use is the production method. Here the difference between initial cost and trade-in or salvage value is divided by the anticipated total units of production. For example, in a passenger car the factor would be based on the total mileage and the depreciation during any period would be the mileage covered during that period times the above factor.

A third system used is to charge as depreciation the drop in the book value or the trade-in value of the unit over the considered period. This system is applicable primarily to units with short economic lives for it calls for large amounts to be charged to depreciation during the early years. In some cases these amount to as much as 40 percent during the first year and 20 percent during the second. Generally applied, undue demands would be made on the tax levy for excessive amounts either to be put aside in the depreciation reserve account or for accelerated bond retirement.

In estimating the salvage value to be used in computing depreciation, studies should be made to determine the most profitable method of replacement. Common practices in the handling of the replaced vehicles are as follows: Sale of the unit at public auction; trading in the units on new equipment; conversion to other uses; or stripping of useful parts and selling the balance for scrap. The Department of Sanitation has found that conversion to other uses has been the most rewarding. For example, as the use of salt for fighting snow and ice was extended throughout the entire city, it was necessary to acquire mechanical spreaders in order to complete the spreading operation as quickly as possible. These units consist of a 9-cubic yard hopper equipped with mechanical spreaders actuated by power take-offs from the chassis engine. Instead of buying new chasses for a use which, by its very nature, would be an intermittent one, the Department salvaged about 100 chasses from collection trucks which were scheduled for retirement. The bodies were removed and the chasses were rehabilitated, using the better parts of other condemned trucks. The new assembly works very satisfactorily and has saved the City approximately $600,000.

Similarly 100 other replaced collection trucks were converted for use in the junk collection service. This service was instituted for the purpose of collecting from householders large objects such as discarded ice boxes, furniture, bed springs and the like. The 100 collection trucks which were scheduled for scrapping were adapted for this service by removing the collection bodies and rehabilitating the chassis.

● **SNOW was a problem in the days when this was standard equipment. Clearing streets was a bigger problem then.**

● **RACK-TYPE collection cart of 1909 was manually loaded and unloaded; the foreman made his rounds by bicycle.**

Approximately $600,000 were saved by the City in salvaging the vehicles.

All other replaced units which are not converted, traded-in or sold as-is, are stripped of all serviceable parts such as tires, batteries, wheels, generators, and in some cases even engines, transmissions and axles. Whatever remains is formally relinquished to the Department of Purchase and sold at public auction for scrap. This scheme has proven remunerative to the City, affording a sizeable offset against depreciation.

2—*Rehabilitation.* In deciding whether to purchase new units or rehabilitate existing units, the cost of complete rehabilitation should be taken into account in arriving at the total capital costs. This rehabilitation cost, plus the interest charges against the rehabilitation costs, should be charged off on a straight-line basis against the estimated additional years of useful life produced thereby. Included under the heading of rehabilitation should be major items such as new motors, transmissions, axles, extensive body work and whatever work of major nature would be necessary to keep the unit operating during the estimated additional useful life.

3—*Interest.* The third item of fixed charges is interest. This depends to some extent on the method selected for financing the equipment. Usually serial bonds are issued to cover the cost of acquisition. Here also it is necessary to make use of the economic life of the unit as too short a term will throw excessive charges against the tax levy and too long a term will cause redemption beyond the economic life and discourage replacement.

After the annual fixed charges, on account of the capital investment, have been computed and added to the annual operating costs, a comparison can be made between total costs of the proposed new equipment and the old equipment in service. The use of the analysis method outlined above, with whatever modifications that are necessary to adjust to local conditions, will provide a definitive and reliable conclusion as to the proper replacement time. This method applies where one or more units are being considered and eliminates practically all the guess work that characterizes most equipment replacement programs in vogue today. In addition, this method of analysis provides a valuable management tool for determining which of the several latest designs and models of equipment available will best fulfill requirements.

OVERHEAD SIGNS FOR BETTER TRAFFIC CONTROL

R. W. WALLACE
Virginia District Traffic Engineer, Suffolk, Virginia

ADEQUATE signing of any location involves three basic principles which must be strictly observed, i.e., simple and complete message; legibility; and proper placement. No one can be considered the most important since any one is dependent on the other two for greatest efficiency. It may be noted, however, that a great many of the signs along the nation's highways seem to be perfect in all respects except location.

In many places, particularly at intersections with heavy business development adjacent to the roadway, the placement of a sign often depends more on the characteristic of the roadside development than on the correct distance to the subject. To be most effective an advance destination sign should be placed a distance of 300 to 500 feet from the intersection. This sign at 1000 feet can be almost worthless and at less than 200 feet may slow traffic and hold the driver's attention at a time when it is essential that he be watching the road and other vechicles. Yet it is frequently impossible to locate the sign within its effective range without putting it against an unfavorable background or in poor lighting. This problem can usually be solved by "going upstairs" and placing the sign over the highways where interference from lights and other signs will be at a minimum.

The message on an overhead sign should be made as simple as possible. Because of wind resistance and load it is impractical to use a sign much larger than 8 feet by 4 feet or 10 feet by 4 feet and the necessity of using large lettering with a heavy stroke requires a condensed message. For multi-lane highways it is desirable to use a separate sign for each lane, particularly if the intersection ahead is channelized. Letters should be not less than 12 inches in height and preferably 15 or 18 inches. Small lettering requires more effort to read and consequently takes the driver's eyes

● **TRUSS mounting of overhead signs. Fair reflectorization is obtained with high beam lights, but visibility can be reduced by oncoming cars, or by side lighting.**

from the road at a critical moment. A heavy, sans-serif type letter has proved very satisfactory.

In color the regulatory and warning signs follow the National Manual, that is, white on red for "Stop" and black on federal yellow for warning. It has been found that black on white has very poor visibility when against the sky so the latest trend for other signs is toward white on black for greater target value.

Reflectorization in overhead signing is a much debated subject. To clear traffic the sign should be at a height of not less than 17 feet above the road. If the light that is reflected from the sign must compete with bright lights from a nearby business establishment the results will be poor. In favorable locations, either reflectorized sheeting or the button type units may reflect enough of the available light to produce a legible sign.

Several types of illuminating units have been used to light the signs. The gooseneck units have proved satisfactory where they can be so mounted as to prevent light from shining on the road behind the sign. Steber units mounted at the sides or bottoms of the signs will provide effective illumination without directing light to the road. These units can be placed on 2 or 3-foot extensions so that the sign receives uniform lighting. The Virginia Department of Highways has not yet tried out fluorescent lighting of signs, but recent developments on fluorescent lighting seem to indicate the need for some experimentation along this line.

There are three structures in general use for mounting the signs: span-wire, mast arms, and trusses. Of the three, the span-wire is the simplest and least expensive since the only work involved is the planting of two poles and stretching the cables. For small signs with little weight and wind resistance the span-wire is satisfactory. Larger signs place excessive strains on the cables and will have enough movement in even light winds to cause severe chafe. Another drawback is the difficulty of getting the signs to hang level. Even when fastened between parallel cables there will be enough movement in a wind storm to cause the illuminating units to dance about and shine in a driver's eyes.

Many of the objections to the span-wire mounting are found also in mast arms. While the mast arm sign can be hung level without difficulty, the weight and wind resistance are still factors that can cause trouble. Where a mast arm is attached to a steel pole by means of a clamp a strong wind has been known to turn the arm on the pole. In one instance this was corrected by welding pieces of 3/8 inch reinforcing steel to the pole underneath the clamp. Sway of the sign can be lessened by attaching a chain to the lower corner and securing it to the pole.

A rigid truss is probably the most satisfactory means of supporting overhead signs. A well-designed truss will support greater weights and withstand much stronger winds than a span-wire or a mast arm; and being secured to a frame, the sign has no tendency to sway. Lights can be attached to a truss in many ways.

Trusses may be constructed of pipe or tubing or of structural tees or I-beams. Several excellent trusses are on the market and some highway departments build their own. In 1951, the Bridge Division of the Virginia Department of Highways designed a truss to be fabricated of extra strong 1-inch and 3/4-inch steel pipe. Twenty-eight trusses of this design have been erected in Virginia and several other states have made or are making trusses on the same pattern.

At first glance the Virginia truss appears complicated, but with proper tools, molds for bending, and a jig to hold the shape while welding, the truss can be made in a surprisingly short time. The longest span of any Virginia truss now in use is 67 feet, but greater spans will probably be safe. The existing spans have stood undamaged through two hurricanes and many storms only slightly less severe. The distinctive appearance of a truss is perhaps its greatest asset. It is next to impossible *not* to see one, and the sight of the structure is a warning of a dangerous and/or unusual situation.

Pricewise, trusses will cost between $500 and $1500. The first Virginia truss cost about $1250, the high price being the result of inexperienced workers and much experimentation of fabricating. Currently the cost of a completed structure is around $550. It may be possible through mass fabrication to complete a unit for as little as $350 to $400, but I do not believe that the average highway department will be able to reach that figure with a limited number of trusses.

● **DOUBLE mast arm directional signs, white on black, with 10-inch series D lettering, give good visibility. Weight and wind resistance can cause some trouble.**

RUBBER-JOINT PIPE SOLVES TOUGH SEWER INSTALLATION PROBLEM

HOUSING DEVELOPMENT companies faced with disproportionately high sewerage installation costs due to abnormal trenching and pipe-laying conditions, might find an answer to their problem in a recent experience of the Tracydale Development Company.

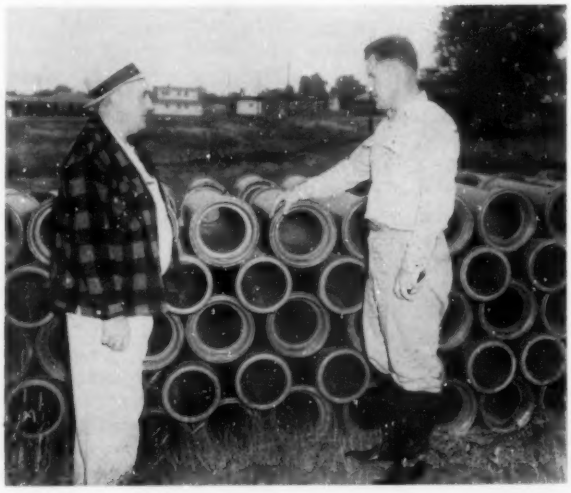
In planning disposal lines to service the 42 residences and 10 commercial buildings of this company's housing project in Millcreek Township, near Erie, Pa., sub-soil tests revealed that several thousand feet of sewer mains and laterals would have to be laid in a stratum of water-bearing sand. Trenching alone in such ground would be costly enough; and man hours required to lay the line, couple it in flooded trenches and yet meet infiltration requirements would be also staggering.

Tracydale's only encouragement was the word of township engineers that the rubber joints specified for the lines would enable workmen to get water-tight pipe joints quickly, despite the tough conditions, and thus help keep overall installation costs down. But until construction bids came in, Tracydale was still not convinced that sewer installation costs would not be way out of proportion to other costs of the project. Lee Taylor, General Contractor of Erie, Pa., had the contract for the job at $45,000.

● **TOUGH conditions were typical of this job. Preassembled rubber joints permitted coupling the pipe in water and backfilling at once, while assuring tight joints.**

● **SPOTTING pipe along trench line using Drott Skid-Shovel.**

● **SEWER pipe ready for laying, showing rubber joints.**



EROSION CONTROL

as a Tool in MAINTENANCE

M. W. FISHER,

Engineer of Maintenance,

State Highway Commission of Wisconsin

EROSION of fine-grained and silty soils in highway ditches and backslopes, on and off the highway right-of-way, is a problem of considerable magnitude. Various methods have been utilized to retard or prevent this destructive action, such as planting, sodding, dumping of rubble in the affected area, and the use of wooden, concrete, or stone ditch checks. Wooden ditch checks will rot, whereas checks made of stone or concrete are relatively easy to displace, unless the stone or rubble are cemented together. Even when an expensive practice is followed, an exceptionally heavy flow of water may cause damage by cutting a new channel into the ditch bank. All these methods provide temporary relief only for a short duration; however, this temporary relief for a short duration is often all that is needed to permit for the natural vegetative cover to become established and effect a more or less permanent cure.

In our State, the erosion control problem is divided into three parts or localities: One, where the type of soil is primarily topsoil; second, where the soil is light and sandy; and third, along the banks of the Mississippi, Wisconsin, and other large rivers where the problem is gully erosion.

During periods of heavy rainfall, especially during the time when the fields are lacking in protective root systems a considerable amount of topsoil is eroded into road ditches. In some cases the water carries stone, gravel and other subsoil matter which fills up the highway ditches, while the water undermines and washes out part of the under-the-highway culverts and drainage structures. Clearing ditches and structures of dirt and debris is a large job and restorative or corrective measures undertaken to prevent a reoccurrence many times presents a major task.

Backslopes which do not have a good cover of vegetation are subject to considerable amount of sheet erosion. Quite often this is remedied by filling in the little gullies on the backslopes, adding some topsoil and seeding. Sometimes this condition is remedied by filling in with sod and fill material from nearby ditch cleaning. Such "soddy" material when placed on the backslopes may provide the necessary seeding and vegetation to correct this condition. Frequently backslopes are badly eroded in a cut section where there is no topsoil. The general solution here is to smooth the areas and add a sufficient amount of topsoil or grass mats with seeding and mulching to encourage the continued growth of vegetation.

Mechanical Devices

One of the first steps in the use of mechanical devices for soil conservation and erosion control is the procedure for protecting the low swales and natural drainage channels that act first to collect and concentrate runoff. These factors exist by reason of the topography—the channel being above the water table and receiving no water except precipitation. These channels are sources of incipient gullying. The gullying forms because the energy of moving water tends to scatter the soil particles—disrupting them and carrying them away. Some soils are

● **LEFT: Sodded ditch bottom remains intact, but inslopes eroded badly due to insufficient sodding. ABOVE: The erosion occurring at the discharge end of a culvert pipe can be very severe.**

● **EXTENSIVE erosion of backslopes is likely in sandy soil without good cover.**

naturally more compact than others or are held together better by a binding medium, and do not erode as easily. However, the principal factor in the comparative degree of erosion is the velocity of the flowing water in contact with the soil. It is commonly held that the erosive power increases as the square of the velocity increases. If the velocity is tripled, the erosive power is multiplied nine times. The steeper the slope the greater the velocity; hence, a greater tendency for gully formation.

Since no natural slope has a continually consistent grade to begin with, and erosion itself is not uniform, the gully is a succession of steps rising upstream. The natural force of the water at each step further intensifies erosion by undermining the edge of the step, the gravest condition being found at the head of the gully. Thus the gully progressively runs upstream and branches tend to form sidewise to the main gully. While in some instances vegetation, such as brush, large stones, and other filling material, can ultimately be utilized in some degree as protection against further growth of a gully, mechanical checks are usually required to stabilize the bed and banks for a sufficient time to enable vegetation to attain a satisfactory stand. Where the situation precludes the ultimate use of vegetal cover for controlling erosion and active gullying is in progress a perpendicular check becomes necessary. These mechanical checks form successive pools in a series of steps where the current is reduced and the inherent energy of the water is dissipated as it falls over the check.

Any dam or obstruction to flowing water constitutes a check, but the term "check dam" is usually applied to the comparatively simple structure used in small and medium-size gullies. The main purpose is merely to retard the water and reduce cutting action. Inadequate spillways are a common cause of failure in such dams. Sufficient discharge capacity must be provided to handle the runoff from intense rains or the dam will be over topped or washed out around its sides. Each check dam must have a weir notch big enough to carry the maximum flow.

Check Dam Construction

In the construction of check dams an attempt is made to use local materials. Whenever material contrary to the surrounding material is used, an attempt is made to backfill and blend neighboring material into the construction. It has been learned by experience that the weakest part of the structure is generally where a foreign stable material meets with the local unstable material. Except in a few cases, these check dams are temporary and will assist only until that time when the ditch has an opportunity to fill up with topsoil and is again protected by natural vegetation. However, in some cases these check dams, gully head plugs, and drop inlets and outlets for culverts, are made of more permanent type material, such as riprap grouted with Portland cement, Portland cement, corrugated metal pipe, and grass mats. These stabilizing structures are constructed with the greatest amount of barrel width possible in order that the water will be as little concentrated as possible.

It is also our experience that it is poor practice to cut down the cost of the structure by making the barrel too narrow. Extended wings of more economical material and design can be employed which will protect the structure from being destroyed by having the water overflow and by-pass the structure, causing failure.

The foregoing describes the common methods of handling erosion problems that may arise subsequent to construction operations; however, erosion control features and facilities incorporated into the original construction, if adequately designed, will do much to eliminate the necessity for extensive maintenance.

Special problems of landslide control, gully, ravine or stream erosion, will require treatment based upon the factors involved, but the rapid healing of construction scars through the promotion of vegetal cover evidences to the general public the most noticeable progress and gives a large measure of satisfaction. The promotion of growth cover can be facilitated in a number of ways. This fact was clearly demonstrated by the joint-research project carried out by the New York State Department of Public Works and the Bureau of Public Roads under the supervision of Harry H. Iurka. The study showed that good results in securing vegetative cover are dependent upon the proper selection of seed, seeding at the proper season, and/or mulching, with proper attention to nutrients in all cases. In addition, it was found that "maintenance is the most important controllable factor in obtaining and retaining satisfactory turf."

Construction projects which have required mulching seeded areas have shown good results under soil and climatic conditions prevailing in Wisconsin. During the 1955 construction season major bid items for restoring vegetative cover included 14 million sq. yds. of seeding at an average unit price of 1.6 cents per sq. yd.; 378,000 sq. yds. of straw or hay mulching at an average price of 6 cents a yard; 196,000 sq. yds. of sodding at 62 cents; and 5 million sq. yds. of salvaged top soil, average depth 4 ins., at 11 cents a sq. yd.

● **GROUTED rubble masonry wall has failed due to unstable soil on steep slope.**

How ONE COMMUNITY *is Beating* the WATER SHORTAGE

PHIL HIRSCH

AN AMBITIOUS program aimed at increasing the utility and efficiency of its water system has been launched by Riverside, Ill. The village is attempting, first of all, to overcome the handicap created by the fact that most of its supply—1.448 mgd out of a total of 1.948 mgd—comes from two wells. More or less frequently, the pumps that serve one or the other of these wells run into mechanical difficulty, or a well shaft breaks. As a result, water reserves on the distribution side of the system fall lower than village officials would like them to. The immediate worry is that there won't be enough water available during peak demand periods for fire protection purposes.

The wells pose a problem for the future, too. Like most other communities in the Chicago area, Riverside is gaining population. The water table, however, is dropping steadily, decreasing the yield from each of the village wells. Riverside also has a distribution problem. Hydrant flow, in many cases, is insufficient to meet the standards of the fire insurance underwriters.

To solve the first problem, Riverside currently is increasing its storage facilities by building a 675,000-gal. underground reservoir. The new reservoir will be filled from an existing 16-in. line which brings in purchased water originating in Lake Michigan. This water is sold by Chicago to the Brookfield-North Riverside Water Commission and is transported to Riverside and a number of other suburbs through a 20-in. supply line.

With the new underground reservoir in operation, there will be a minimum water reserve of approximately 1.17 million gal. for fire protection purposes. The village needs at least 675,000 gal; however, at present, there are times when only 494,000 gal. could be made available. This undesirable situation would occur if the larger of the two wells went out of service between the hours of 5 PM and 9 PM, a peak demand period. Riverside is prohibited by law from tapping its Chicago supply between 5 PM and 9 PM. Thus, the village would have to depend on stored water and the second well for its supply.

● **675,000-GALLON underground reservoir, shown at an early stage of construction, will provide necessary storage for normal use and fire protection reserves.**

At present, storage capacity totals 950,000 gal. and of this amount, 200,000 are underground, 350,000 are on the surface, and 400,000 are elevated. The second well yields approximately 600 gpm. (864,000 gpd.). In a peak demand situation, consumption would total approximately 600,000 gals. during the four-hour period when the Chicago supply was cut off. The well would supply approximately 144,000 gal., leaving a balance of 456,000 gal. This would have to come from the 950,000 gal. reserve; hence, only 494,000 gal. would be left for fire protection purposes. By adding the new reservoir, however, the reserve will be raised above the marginal level.

Construction of Reservoir

Now under construction, the reservoir will be finished in April, 1957. Cost of the project, estimated at $160,800, is being borne by revenue bonds. The tank, built of reinforced concrete, is laid out in the shape of a trapezoid. It is 130 ft. long, 16 ft. deep (14.5 ft. water depth), 75 ft. wide at one end and 40 ft. wide at the other. Two Byron-Jackson vertical pumps, each rated at 1,000 gpm, will draw water out of the reservoir and send it into the distribution system.

Riverside's distribution system consists of 195,000 ft. of pipe. About 64 percent of the system is composed of 4-in. secondary lines.

Friction losses in these pipes are so high that, throughout most of the village, insufficient water is available to fight large fires. This system is supplied from two pumping stations. One, at the south end of the village, draws in water from both the Chicago supply line and the smaller of the two wells. Three American Well Works high-lift pumps draw Chicago water through an existing 200,000-gal. underground reservoir. Two of these pumps are of 700-gpm. capacity, while the other is 600-gpm. Each pump is direct-driven by a 25-hp, 220/440 volt Western Electric motor. The discharge is through an 8-in. pipe into a 16-in. distribution main. A Layne & Bowler deep well centrifugal pump, rated at 600 gpm., brings water out of the well. This unit is driven by a 150-hp, 2300/4000-volt Electric Machinery Co., synchronous motor.

The second pumping station is located at the north end of the village. Facilities here consist of a Peerless 1200-gpm pump, driven by a 200-hp Electric Machinery Co. 440-volt synchronous motor, plus two high lift pumps, both manufactured by Dayton-Dowd. One of the latter is rated at 1250-gpm, the other at 1,000-gpm with each driven by a 50-hp GE 440-volt motor. The water supply at the north station comes from the larger of the two wells, which is rated at 950 gpm (1.368 mgd). Water feeds into a 200,000-gal. steel surface reservoir, and is drawn out by the two high lift pumps which discharge into the distribution system.

Fire Requirements

Fire insurance underwriters require Riverside to have a minimum 3,000 gpm supply available at hydrants in commercial areas, and various lesser amounts in other sections. In each case, there must be a residual pressure of 20 psi. A few years ago, fire flow tests were taken at 12 locations throughout the village and it was found that only one of these locations measured up to requirements. Of the others, two were 20 percent below standard, eight were 75 percent below, and one was 90 percent below.

Within the next few years, some four miles of new secondary mains, 10 to 12-in. in diameter for the most part, will be built to correct this problem. The new mains will run between the primary supply lines that now bring water from either of the two pumping stations.

The first part of this project is now underway. It consists of a 12-in. secondary line running out to the western limits of Riverside. Along the way, this line will be connected to several existing 4-in. pipes. The end of the 12-in. feeder will be connected, through 10 and 8-in. pipes, to an existing 8-in. line that runs back to the central pumping station. Water flowing through the new line will trace the path of a loop.

By connecting this and other new secondary mains to its existing net of 4-in. supply lines, Riverside expects to lick the hydrant pressure problem. Village Manager G. L. Opper expects that as a result of this new construction, both pressure and flow at most hydrants in the village will be sufficient to meet underwriter requirements.

Besides the distribution and storage facilities, Riverside is also planning to increase its water intake from Chicago to provide for future needs. Approximately 500.000 gals. are purchased from the Brookfield-North Riverside Water Commission. Present peak demand is 1.85 mgd., and the average is 935,000 gpd.

By 1975, it is estimated that Riverside's present population of 10,500 will have risen to 12,500. At that time, the peak water demand is expected to total 2.85 mgd.; the average, meanwhile, should reach 1.5 mgd. The water supply available from wells, meanwhile, will probably be much less than it is now, for the water level in each has been dropping steadily for the past several years.

The central station well,drilled in 1924, had a static water level in 1939 which was 207 ft. below the well-house floor and the yield was 800 to 850 gpm. By 1944, the water level was 367 ft. below the well house floor, and the flow was 750 gpm. Since then, the level has dropped more than 100 ft., and the well is delivering only 600 gpm.

The story of the north well is similar. Drilled in 1931, the static water level originally was 270 ft. below the well house floor and the yield amounted to 1250 gpm. Today the water level is almost twice as far down and the yield has dropped to approximately 950 gpm.

To make up for this gradually diminishing well supply, and also to provide for the demand that will be created by increased population growth, Riverside is planning to purchase more water from the Brookfield-North Riverside Water Commission. The village wants to buy a total of 800,000 gpd to meet average day demands and a total of 1.6 mgd. for peak-day demands. Capacity of the supply line running from Chicago into Brookfield is now being doubled, through installation of additional pumps, and Riverside officials are confident that they will have little trouble obtaining this increased supply.

Loading Salt for Snow Fighting in New York City

● **JUST A FEW weeks after New York City's Department of Sanitation bought 20 Michigan tractor shovels, the units were at work loading salt and clearing away the snow that fell in the first storm of the winter season. The scene above shows one of the Michigans loading from a stockpile to keep the salt spreaders supplied.**

● SAMPLE of the problem. The uncontrolled grass grows profusely, even in such places as downstream from culvert.

● ON UPSTREAM side of culvert shown at left, the manna grass growth has been controlled by "Telvar" W weed killer.

Mosquito District

LICKS STUBBORN WEED

TACKLING a stubborn weed problem with 26 years of Yankee persistence appears to have paid off at last for the Cape Cod Mosquito Control District. This district was formed in 1930 when the towns that dot Cape Cod realized that choked streams were gradually turning their farmland to swamps, and that mosquitoes were not only a hazard to local health, but a threat to the summer vacation colonies which contributed much to the area prosperity.

Worst spot of all the Cape's 400 square miles was a 1½-mile stretch of the Herring River, a short stream no more than 15 or 20 feet wide, draining into Wellfleet Harbor and Cape Cod Bay. The Herring River is one of the most important drainage waterways on the Cape, and one of the most costly to maintain. It controls the drainage of three 40-acre ponds and about 1200 acres of mosquito-breeding swampland in and around Wellfleet and Truro.

Each summer, a blanket of grass, unlike any growing elsewhere in the vicinity has crept out over the surface of the water, forming a mat heavy enough to support men walking on it. The grass has been identified as one of the family of manna grasses [Glyceria Pallida (Torr.) Trin.] which grows in shallow water throughout the northeastern quarter of the United States, and up into Nova Scotia.

In 1936, the State Waterways Department spent $10,000 dredging the Herring River to get rid of the weed, but it has kept coming back, costing the district $2,600 yearly in a losing hand-labor battle for control.

● TEST applications of chemical weed killers made on cattail growths.

Crews of men using rakes with handles 10 to 20 feet long, have been employed to roll the thick mat back onto the shore so the Herring River could flow. Starting as early as three o'clock in the morning, to get a few cool hours, the crews have to lay off when the July sun is high because the temperature gets up over 100° and humidity reaches the saturation point.

Oscar D. Doane, Sr., who has been superintendent of the district for 11 years, and his predecessors, had sought much professional advice and had tried many mechanical gadgets and chemicals which seemed to promise results. In the past six years, Oscar Doane, Jr., assistant superintendent has become interested in the new science of weed control. He wrote a number of chemical companies for advice about that peculiar grass in the Herring River. In May, 1955, at a Mosquito Control meeting, Mr. Doane heard a Du Pont technical representative, William I. Boyd, describe a comparatively new chemical—"Telvar" DW diuron weed killer. Later Mr.

● Typical bunch of manna grass tops and roots, showing manner of growth.

● BEFORE chemical control of manna grass was accomplished, the mass of choking weed had to be rolled back with long handled rakes—hard work and a costly job.

Boyd agreed to provide samples of the chemical, and to give his personal supervision for trials on the Herring River.

Within a few weeks after the trial application, grass in some of the test plots was dead. If similar results can be obtained along the whole 1½-miles of dense grass, the Wellfleet mosquito control budget will come down to the level of other Cape Cod communities, instead of being three times as much.

"We used to have to keep crews working out there with rakes," say the Doanes. "Now they walk around with a little watering can. There's nothing to it. We don't even have to buy a modernistic piece of machinery to apply it. We can do for three or four hundred dollars what has been costing us $2600, and it looks like the job will be done for good. Even if we have to repeat the chemical treatment every year or two, we're still way ahead on dollars, and there's virtually no labor time involved. We can keep our crews on ditch maintenance, and other needed jobs."

This represents a new use for "Telvar" weed killers. These chemicals are not generally recommended for true aquatic weeds because they work through the roots, and usually the water around aquatic weed roots either dilutes the chemical or carries it away from the place where it is needed. However, the Herring River manna grass appears to root in the mud to some extent. Then too, as it mats, roots develop in the mat above the water line. It is these roots which seem to take in the "Telvar." If they didn't, past experience with aquatic weeds would indicate that the chemical would wash away before it had done its work. At the time of the August, 1955, application, the river was at its lowest, and grass growth was at its rankest for the season. The problem now is to schedule treatment of the entire river so that the weed killer will have a chance to work.

From a purely entomological point of view, the best time to treat would be ahead of the mosquito-hatching season. Since the chemical takes several weeks to take effect, the deadline for pre-hatching application would be June 15. Melting snows and spring rains left a high water table last spring, but the job was finished on June 12, and Oscar Doane, Jr., reported in August: "We won't have to touch the river this year."

On the basis of this success with the troublesome grass, the district is going ahead with experiments to control cat-tails and other swamp vegetation with "Telvar" weed killers in hopes of licking the vegetation which is a chief obstacle to efficient drainage of several thousand acres of swampland.

Communications for a State Highway Division

The Wyoming Highway Radio system consists of fourteen "mountain top" repeater stations and 57 base dispatch stations. Two mountain top stations and 5 dispatch stations have been added during the past two years. Mobile equipment includes 370 radio equipped cars and trucks, six motorcycles and twelve portable hand carried units.

The radio system is divided into two networks, law enforcement and highway maintenance. The highway maintenance network provides service to supervisory personnel, engineers and maintenance crew foremen of the Wyoming Highway Department. Mobile units are installed in vehicles operated by construction engineers and crew foremen, and in all rotary snow plows. The construction division has made much use of the system both on actual construction projects and in field reconnaissance surveys. It has enabled field personnel to keep in close contact with local shops and the headquarters office in the Cheyenne office.

During the past two years, the installation of point-to-point circuits has been nearly completed. This system allows personnel in the Cheyenne office to talk with all major stations in the state. All equipment to complete the project has been received and only minor adjustments remain for completion.

In addition to the functions already described, the system serves as the primary warning and communications system for civil defense. Flight plans are also filed with the system and emergency search and rescue assistance is provided, as well as up to the minute road and weather reports.

The communication system is maintained by five technicians, one in each district, two junior technicians and the chief radio engineer in Cheyenne.

INDUSTRIAL AND SUBURBAN GROWTH PROMPTS EXPANSION OF WATER SYSTEM

CHARLES H. KESSLER

● **DRESSER couplings are quickly and easily installed, using simple tools.**

EXPANSION and modernization of the Reading (Pa.) water system became necessary with the steady growth of industrial and residential areas. There was a need to increase filtered water capacity and storage, to provide better pressure in outlying sections to assure better fire protection and to improve the reliability of the system.

Water demand from a population of 135,000 persons in the Reading area reaches a summer peak of 22 mgd. When the current $4,000,000 enlargement and replacement program is completed, Reading will have a water system capable of delivering up to 30 mgd to a population of 150,000 persons.

The water is retailed to residents of Reading, Kenhorst, Grill, Greenfields, parts of Cumru Township and to suburban areas adjacent to the supply lines. It is wholesaled to the Boroughs of Wyomissing, West Reading, Temple and the Muhlenberg Township Water Authority for resale by these communities through their own distribution systems.

Service to this wide area is made complex by the Schuylkill River which winds in a serpentine path through Reading. The old section of the city is east of the river while the newer wards and most of the suburbs are to the west. Many of the improvements were designed to provide better service for the newer areas.

Water Sources

Reading's principal source of raw water is Lake Ontelaunee, an artificial basin created in 1935 by constructing a dam across Maiden Creek nine miles north of the city. The lake has a drainage area of 192 square miles and a water surface of 1082 acres at spillway elevation 293.80. It is irregularly shaped with a maximum depth of 41 feet, maximum width of 1½ miles and a length of 5½ miles along the channel. Lake Ontelaunee has a capacity of 3880 million gallons which, it is estimated, will give a reliable minimum yield of 37 mgd.

To minimize pollution, a marginal sanitary strip with a minimum width of 500 feet around the lake has been planted with evergreen trees. In addition, there are more than 2,000,000 trees on the 3142-acre watershed.

● **LAST SECTION of 30-inch steel pipe is lowered into place, completing construction of Northwest pumping main. This pipeline crosses the river three times.**

● SECTION of 30-inch steel pipe 120 ft. long was easily handled by a single crane. The intermediate joints of the section were constructed above ground.

Raw water from the lake, selected from three intake levels, flows by gravity through a concrete-lined 81-inch tunnel 2800 feet long and through two parallel 60-inch conduits 4680 feet long to a screen house at the Maiden Creek rapid sand filters.

This plant, located on the west side of the Pottsville Pike just north of Willow Creek, was constructed for treating water at a rate of 40 mgd. However, the filters and filter building had a capacity for only 20 million gallons per day.

Water Treatment

The plant consists essentially of means for fine screening, treatment with coagulant, mixing and settling, filtration through rapid sand filters, low lift pumpage for aeration, pH control and disinfection. Clear water basins arranged for flow in series provide 10,000,000 gallons of filtered water storage and 16 hours retention for chlorine recation. These are located between the filter and the pumping station.

One of the major projects of the current improvement program was to double the size of the filter building; six new filter bays were constructed and two were equipped. The other four bays will be equipped as the demand increases. Each of the new filters will produce 3.3 mgd. The design operating rate is two gallons per square foot per minute. The two new filters have Leopold ceramic tile bottoms. Instead of sand as a filter medium, a 24-inch layer of Anthrafilt was used. Builders-Providence controllers and rate-of-flow hydraulically operated Darling valves were installed.

All alum feeders and rate-of-flow controllers at the filter plant were modernized. During construction, the general contractor, R.S. Noonan Co., York, encountered difficulties getting the concrete wash gutters level. After much study and experimentation, the leveling was accomplished by grinding.

A new intake was built and equipped with a Wheeler Economy 20 mgd low head vertical open impeller pump. It will be available in the event of any difficulties with the 25-year-old intake line from Lake Ontelaunee.

Most plate glass windows at the filter plant were replaced with glass blocks and glass blocks were installed in the new one-story addition to the structure. The change to glass blocks was made to reduce window cleaning costs and to reduce algae growth. A new chlorine residual recorder was installed to record continually the chlorine content of the filtered water, thus assuring adequate disinfection.

From the filter plant, the water flows through a 60-inch concrete conduit one mile to the Maidencreek Pumping Station. Two new pumps were installed as part of the modernization program. An old Allis-Chalmers vertical triple-expansion triplex, single-acting 15-mgd steam pump was removed and replaced by a motor driven centrifugal 14.5-mgd DeLaval pump. With this installation all the old steam operated pumping facilities were replaced with motor driven pumps.

The other addition to the pumping station was a motor driven 25-mgd DeLaval pump. Facilities installed prior to the current improvement program include a 17-mgd DeLaval two-stage centrifugal and an 8-mgd DeLaval centrifugal. All pumps are direct connected by short lines of 48-inch pipe with 36 and 30-inch branches, to the filtered water receiving well. Discharge lines are arranged and gated so that any pump can pump to both supply mains and so that one centrifugal can be kept operating while repairing any valve.

Distribution Improvements

Water is pumped into the city's distribution system through two lines flanking the Pottsville Pike for a six-mile distance. One is a 36-inch main while the other consists of about 11,500 feet of 30-inch pipe and 9,500 feet of 24-inch pipe. Because of heavy highway traffic, both pipelines have been subjected to rather frequent breaks in recent years.

To give the distribution system greater reliability, an additional transmission main was built. The new pipeline, known as the Northwest Pumping Main, links the pumping station with a new Northwest Reservoir, a distance of 20,494 feet. This steel force main has a 30-inch diameter and crosses the Schuylkill River three times. The pipe is one-quarter inch thick except at the river crossings where thickness is one-half inch. As an added protection against breaks in the river, sections of the pipe lying on the bed of the stream are encased in six inches of concrete.

Bethlehem Steel Co. supplied the steel pipe in 40-foot lengths. In the field, three 40-foot lengths were butt-welded together to form 120-foot sections. These long sections then were lowered into the trench and joined with Dresser couplings.

The new line, designed for a capacity of 8 mgd, will insure consumers of adequate water service in case flow through the Pottsville Pike mains is disrupted. In addition, the new transmission line will provide better water service for areas west of the Schuylkill River and to the downtown business district.

Prestressed Concrete Tanks

The new reservoir, four miles northwest of the city, was designed to hold 26,000,000 gallons. Two cylindrical tanks, each with a 13,000,000-gallon capacity, are being built of pre-stressed concrete. The tanks are believed to be the largest of their type in the United States and the second largest in the world. Each tank will have walls 13 inches

thick, pre-stressed by high tensile strength steel wire. The wire will have an initial stress of 140,000 pounds per square inch. Pre-stressing is being done by Preload Co., Inc., New York.

Each of the twin tanks at Northwest Reservoir will have an inside diameter of 292 feet and a water depth of 26 feet. A flat slab concrete roof eight inches thick will be supported by 120 concrete columns in each tank. Electrically operated Davis ball valves automatically will maintain maximum water level, permit flow of stored water for service consumption and close the flow in case of a break in a 36-inch main.

Other facilities at the reservoir include a control building housing a concrete valve chamber and a small structure for a residual chlorine recorder. An access road 1280 feet long and 12 feet wide will be built from nearby Bernville Road to the site. Roadways 2180 feet long and 10 feet wide will be built around the basin. The area occupied by the tanks will be enclosed by a 2440-foot chain link fence.

The general contract was awarded to B. F. Ziegler, Hazleton, Pa., at a bid of $913,758. In excavating, the contractor encountered a large amount of unexpected rock. As a result, the cost probably will be increased an additional $300,000. The mechanical contract, held by Tri-County Constructors, North Hills, Pa., includes installation of storm sewers, cast iron piping and chlorination and instrumentation equipment.

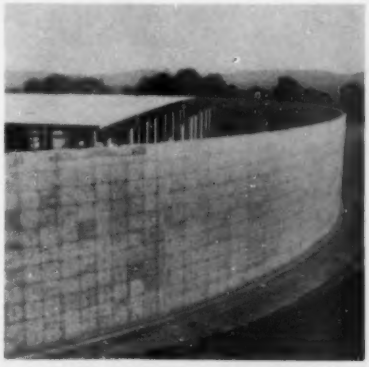
From the reservoir, water will flow to the city through a second section of the Northwest Pumping Main. This 36-inch steel pipeline goes southeast from the reservoir along heavily-traveled Bernville Road and Schuylkill Avenue where it is connected with the remainder of the city's distribution system.

A branch section of the new main in the city's 19th Ward consists of 3100 feet of 30-inch cast iron and 1190 feet of 20-inch cast iron pipe. Wrought iron pipe 30 inches in diameter and 321 feet long was used to cross the Tulpehocken Creek at the Warren Street Bridge. Water engineers plan to extend the line from the bridge southward along the western shore of the Tulpehocken and Schuylkill. It would extend from the Warren Street Bridge to an existing main at the Buttonwood Street Bridge. This will provide a loop for the West Reading-Wyomissing area.

The transmission line from the pumping station to the 19th Ward has 63 Darling gate valves ranging in size from 4 to 30 inches. In addition, there are two Davis 20-inch ball valves and 26 air and vacuum valves from the Valve and Primer Corp.

Another loop designed to improve water pressure and reliability west of the Schuylkill River was accomplished by installing a 16-inch wrought iron pipe across the stream at the Bingaman Street Bridge. The 1600-foot pipe, provided by Posey Iron Works, Lancaster, is suspended from the bridge. This main will serve the city's 18th Ward, the fastest growing residential and industrial area of Reading, as well as suburban districts to the south. Previously, water was delivered to this region through only one 16-inch pipeline. Reserve supplies of filtered water are stored in two high service standpipes in the 18th Ward.

To supply the Bingaman Street Bridge line, a 16-inch mechanical joint cast iron main was installed on Water Street in the old section of the city. This 4000-foot pipeline also serves an industrial area on the east bank of the Schuylkill via pressure reducing valves.



● **CONCRETE wall of Northwest Reservoir, 13 ins. thick, will be pre-stressed with high tensile strength steel wire.**

● **MILLION-gallon steel reservoir on Neversink Mountain has an inside diameter of 64 ft. and depth of 43 ft.**

New Steel Reservoir

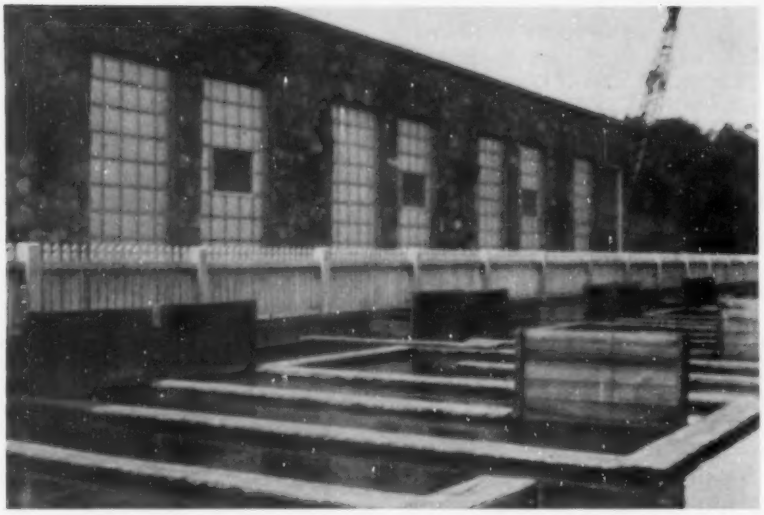
A million-gallon steel reservoir was erected across town on Neversink Mountain to provide better pressure and more reliable water service in the eastern section of Reading. The site for this reservoir was graded in 1939 under an improvement program of the Works Progress Administration. The tank has an inside diameter of 63 feet and a 43-foot water depth. It was erected by Herbert J. Elkins, Inc., Philadelphia, with steel provided by the Chicago Bridge and Iron Co.

Another source of raw water for Reading's water system is Antietam Lake, a small artificial basin 3.4 miles northeast of the business district. The lake has a capacity of 101,000,000 gallons at spillway elevation 510.2 with an estimated safe yield of 2.3 mgd. Water from the lake flows by gravity through a single line of 24 and 20-inch cast iron pipe 2.6 miles to three open slow sand filters located on Perkiomen Avenue just east of the city limits. Each filter has a daily capacity of 750,000 gallons.

When the current expansion program was planned, provisions were made to convert the Antietam filters into a clear water and equalizing basin with an operating capacity of 8 mgd. New filters with a maximum capacity of 4 mgd were to have been built at Antietam Lake. Plans for the two Antietam projects have been deferred for the time being.

Reading's water system also includes Buttonwood Reservoir with a capacity of 926,000 gallons; Green Reservoir with a capacity of 3,210,000 gallons; Penn Reservoir with a capacity of 2,550,000 gallons in the north basin and 3,097,000 gallons in the south basin; Hegel-Gehl Reservoir with a capacity of 15,865,000 gallons; Neversink Reservoir with a 9,922,000-gallon capacity and Hampden Reservoir with a capacity of 29,180,000 gallons.

The water works are owned and operated by the city. The original system was built by the Reading Water Co. in 1819 and purchased by the city in 1865. The current improvement program was financed primarily by a $3,000,000 general obligation bond issue approved by the electorate in 1952. In addition, $500,000 from a 1947 bond issue was used as well as revenue set aside



● **FILTER plant was extended by a one-story addition. Glass blocks were used for the windows to reduce window cleaning costs and control algae growths also.**

from annual water bureau earnings over a period of years.

At the time of its approval, the bond issue was the largest in the city's history. The record, however, was broken in 1956 when Reading voters approved a $4,500,000 bond issue for rehabilitation and enlargement of the city's sewage treatment plant. No tax or rate increase was imposed for the water improvements.

City Council employed Gilbert Associates, Inc., Reading, for engineering work on the water system changes. The company's team of engineers was directed by R. W. Simpson, chief sanitary engineer. Working on the project for the city were Francis A. Heine, chief engineer of the water bureau; Leroy E. Wolfe, assistant chief engineer; Karl H. H. Krott, water engineer, and City Engineer Robert S. Chubb.

ATLANTA has TOP-LEVEL

TRAFFIC CONTROL

ATLANTA HAS ALL the usual elements of traffic engineering and control. Above these it has the Atlanta Traffic and Safety Council. This is a volunteer organization of top businessmen representing 85 percent of the big taxpayers and every kind of business activity. It works at the job of planning. In an annual report it says: "Especial attention has been focused on traffic and transportation, which are the basis of Atlanta's economy."

This idea of a citizen body operating above the political, administrative and professional-advisory functions came out of a provocative experience. Mayor William B. Hartsfield who took office in the 1930s was so shocked by the annual toll of 80 traffic deaths that he took drastic action. He reduced the number to less than 30. But he did it so forthrightly that he alienated the support of the public, and he was defeated for re-election.

That gave the city something to think about. Must law enforcement react so unfavorably? What must be done to make the streets safe, without such a loss? The conclusion came clearly. The citizen body must be drawn in behind elected officials and employed professionals, and give them informed support. The Traffic and Safety Council was organized to accomplish it.

Mayor Hartsfield later was returned to office and has been mayor ever since. Along with most citizens

● **REVERSIBLE lanes are especially effective on such streets as Stewart Avenue, shown here, which carries most of the heavy airport traffic and also Rtes. 41 & 19.**

he thinks of the experience as the beginning of a new day for Atlanta as regards traffic conditions.

The Council works with twelve other organizations in developing plans and it will be assigned the task of carrying out many of the activities contemplated. It was instrumental in creating the Traffic and Transportation Commission, which is the official agency through which it works with public officials. It was able to separate traffic functions from the police department and establish them on a broader base in the Traffic and Engineering Department, of which Karl A. Bevins is director.

It has been especially active in bringing young people to an understanding of traffic hazards and traffic control. A second Teen-Age Traffic Safety Conference has just been held, in which delegates from all high schools participated. Next year this will be expanded to take in all metropolitan schools. It has worked effectively to establish driver training in high schools. And it is very much alive to the threat of drag races and hot-rod clubs, trying to replace them with events which put emphasis on safe driving and mechanical skill, rather than reckless speed.

The Drive for Public Support

Two significant conditions influence the drive for public support. The first is that politicians cannot move out very far ahead of public opinion if they are to be elected to office. They have neither the studied information nor the courage to advocate measures which have not been through the grist mill of controversy. They cannot afford to become targets for uninformed or malicious opposition. So they cannot supply the leadership for a diagnosis of conditions and the formulation of improving measures.

But the second one is unrestricted. The Traffic and Safety Council virtually lives on controversy. It can get any proposal before the public in papers, forums, TV and radio. It smokes out latent opposition by unrelenting discussion. In time the various mediums, civic bodies, Women's Clubs and other organizations may take sides with firm opinions, but this only keeps the mill grinding, and in time the proposal wins or loses. No feelings are hurt. The outcome is the will of the city, and it is nearly always on the progressive side.

Cooperation is the keynote of the process. Elected officials and the professional-advisory staffs look to the Council as a safe support on which to lean. To them it is the "front" which every city administration wishes for, the leadership in tangled problems, and the laboratory in which any proposal can be tested. Thus it becomes the governing body, governing with reason and conciliation. Under its protective cover the administrative officials and advisors find it easy to get together on differences, and, if they fail, they can argue their views before the Council for a decision.

Specific Problems

Speed. Atlanta has suffered long with an arbitrary rule that speed must not exceed 25 MPH in a radius of 2½ miles from Five Points, which is the cross-roads of the downtown area. Atlanta doesn't have a grid system of streets. As Karl Bevins says, every important street starts off from Five Points as a rugged individual, and pursues its straight or winding course to the city limits.

Streets even split up, thinking of Peachtree. One part of it seems to come to a disagreement with the main route and goes off on a parallel course as West Peachtree Street for some miles, and then thinks better of it and rejoins the main course in restored harmony.

The position of the Traffic and Safety Council is that 25 MPH should be enforced in all-residential areas within the 2½-mile radius, with 35 MPH outside. But it holds that all heavily traveled, as well as arteries and expressways, should be speed-zoned realistically with due regard for safety.

This view was hammered out between the Council and the administrative and advisory units, and is firmly established. Just what criteria should govern in establishing a speed for any section still comes in for some discussion. There is increasing confidence that safe drivers find a natural speed for each condition. Higher limits often result in safer driving and a lower accident rate.

There had been no traffic counts until the Traffic and Engineering Department was established, and no mechanical counters were purchased until three years ago. But now the study of traffic is a serious, well organized function, playing its part in every study of limits and regulations. This has resulted so far in a 40-mile minimum speed on expressways, and a 50-MPH maximum, with a trend toward higher limits.

When a change is proposed it is not made hastily. The prevailing speed of cars is taken as the basis of consideration. Changing signs may make no change in speed. A change to lower speeds may result in a higher accident rate. It is recognized that the accident *rate* is declining all over the country. The number of accidents increases, but not as fast as the increase in the number of cars on the road.

● **INTERSECTION on Ponce de Leon Boulevard, showing the computer which governs the entire system and the signal change boxes for the intersection shown here.**

In one case the police chief complained that the accident frequency on a certain section of expressway was deplorably high, and insisted on cutting the speed limit to 25 MPH. The Traffic and Engineering Department agreed. But before the change was made it ran a survey and found that 85 percent of the drivers were going 37½ MPH in the 35-MPH zone, and that the accident frequency was one-quarter of 1 percent, or less than in any other comparable spot. The volume of traffic made the number of accidents seem high.

25 MPH Is Too Slow

When the signs were changed to 25 MPH there was more nervous driving, more hesitation, with more near-accidents in side-swiping and rear-end collisions. Both the Police Department and the Traffic and Engineering Department were snowed under with complaints. People asked: "How come? What's the good of paying for these fancy highways if we have to drive 25 miles an hour?" The signs were quickly changed back to 35 MPH.

Atlanta has many curves and small humps on its streets, and when these combine they demand special attention. Many complaints come in about cars coming up a rise on a curve that becomes sharper than was expected, and going off on tangents into yards. Each rise-and-curve combination is different. Where the number of drivers who do not meet the rise-and-curve combination is high, with safe driving, the location is re-signed to require at least caution, and often slower speeds.

Both the Traffic and Safety Council and the Traffic and Engineering staff are trying to find a speed-zoning principle broad enough to frame all specific decisions. Just what it will be is not clear at the present time, but it is grinding slowly through the mill.

Intersections. When all efforts have been made to make some intersections safe, there is still trouble. Some hidden influence makes it dangerous; accidents occur. The staff has to go out and live with the area until all traffic factors in the neighborhood have been checked. They usually find the trouble. Then the lighting and signing are graded up or down on each of the streets until the danger complex is eliminated.

When complaints come in on intersections each complainer is required to fill in the top half of a form, stating his criticism. A preliminary investigation is then made, and a report is written on the bottom half of the form. These go to Karl Bevins, for personal study. About half the complaints merit further investigation. When the final report is made, on a scoring form adopted from Detroit, the intersection is given a priority number.

This complete study includes pedestrian and vehicle counts, and numerous observations on visibility, the influence of curves, the locations of schools and similar buildings, condition of pavements, prevailing speed of traffic on both streets, number of buses, rises and dips on approaches, and other factors.

Formerly there was a hodgepodge of intersection protection, with no uniformity. Now there is a standard lighting, an overhead signal making the common direction changes. When traffic volume requires it, or the accident frequency runs high, a double-indication system is installed. In this the overhead signal is supplemented by post lights on all four corners. When his visor obscures the hanging signal, the driver still has the post signals to guide him.

Up to the present time the installation of new intersection signals has taken the majority of time and equipment, but now the new work is lessening, and the rebuilding of old intersection systems is taking on the greater importance.

Ponce de Leon Signal System. On Ponce de Leon Boulevard, which carries three U. S. highways and a State highway eastward, a new signal system has been installed at 12 intersections. It is the first of its kind, and is made by the Automatic Signals Division of Eastern Industries. There are other systems which reach toward the ultimate which is attained in this one. Major defects in others have been sudden changes and piling up of traffic.

Signals Help Move Traffic

This system works like a fluid drive. The transition from one condition to another is imperceptible. Traffic does not pile up. Drivers cannot sense the smooth gradations of control. Once entered in the control zone, a car continues through to the last signal with no sudden stops and starts.

The equipment consists of a controller at each intersection which "views" the traffic, and a computer in a central location which does the directing. In non-technical language the Traffic and Engineering Department experts "tell" the computer seven factors to use in directing traffic. The controllers are set to report these factors. The computer makes its calculations and directs the controllers how to change signals to meet the reported conditions. It is electronic automation.

School Protection. When the police department had control of traffic it set up the position of Superintendent of School Patrol with a staff. The new department became very effective. It employed women in uniform, deputized as officers, as crossing guards for a few hours each school day. It organized the crossing patrols of school children, and trained them into a good working body. And it placed all signs and markings around schools.

The Traffic and Engineering Department took this system over and improved it. The Teen-Age Traffic Conference started by the Traffic and Safety Council is drawing children into serious discussions with experts about traffic problems, and the driver training movement in high schools is emphasizing the need for competence. All of this tends to make the protection of school children easier.

The School Zone Problem

But some problems are not easily solved. One that bothers all the traffic agencies is: What is a school zone? Not the area close in, for they have found that children do not get hurt in this area. They get hurt two or three blocks away. Then what is the relation between speed and safety in what is generally called the school zone?

School officials complain about violations of the 15 MPH limit in school zones. When these complaints are run down it is found that drivers have found a natural speed that is safer for all concerned than strict enforcement of the 15 MPH limit. Suddenly slowing down a mass of traffic at a school or other institution is more likely to cause accidents between cars, and less likely to protect children.

The schools always want slower speeds, but the facts do not support their protests. When 85 percent of the drivers find 18 to 24 MPH safe speeds near schools, and the accident frequency is as low as elsewhere, it is folly to insist on 15 MPH for the sake of a disproved notion.

More than that, the abuse of the privilege granted to schools virtually to stop traffic when there is no real danger to children puts law enforcement on a false basis. There has been some discussion of laying out routes which children will be

compelled to follow when nearing school, with special protection along these routes. But the safety agencies see the danger of further irritating drivers who are already impatient with the unnecessarily rigid policing of the women guards.

They see that some balance must be maintained between unhindered movement of traffic and the safety of school children, but they see also that it will not be found in arbitrary regulations such as 15 MPH speed for blocks around a school. Permanent signs painted on the pavement are not realistic. School principals, it is clear, must take responsibility for the children except for the four hours each day when they are going back and forth. Equally clear, all signs and warnings should be removed when school is not in session, on week-ends and in vacations.

A new crossing signal is about to be tried, copied from one in Illinois, with a few modifications. The red and amber lenses will run through four changes, "Rest," "Caution." "Cross," and "Protection." Two of the signals will be erected on an intersection, on diagonal corners. Children wanting to cross will push a button to make the lights change for them. A delay period will allow plenty of time for them to cross, without permitting repeated changing of the lights to hold up vehicular traffic. This will give enough time for a group of children to gather at the crossing.

Stop signs will be erected on the other two corners. Yellow lines will be painted on the pavement to keep the children on a protected route. About 300 ft. back of the intersection caution signs will be erected.

A loosely organized committee has been set up to consider school traffic problems, consisting of the school principal—with representation from the PTA; the Safety Supervisor of the Board of Education; and representatives of the Police Department and the Traffic and Engineering Department. It at least provides a forum in which a better understanding of school safety in relation to all traffic safety can be reached.

Law Enforcement. In the over-all administration of traffic safety, law enforcement does not bulk as large as in other places. When traffic problems are kept continually before the public by discussion and publicity, a better attitude grows up toward regulations. When the driving public is convinced of a sound relation between the signs on the street and their own welfare, they gain respect for what the authorities are trying to do. In this atmosphere law enforcement becomes a deterrent and punishment for those who wilfully break the law; in traffic as in robbery or homicide. It is not for the law-abiding citizen.

Yet the enforcement of traffic regulations is as important as in any other field. A law that cannot be enforced is not a law—an axiom which is as old as law. Karl Bevins expresses the official view about catching up with offenders in this way: "If the chance of getting caught is greater than the chance of getting fined, the public ignores the regulations." Consequently the Traffic and Safety Council takes an active interest in the Traffic Court.

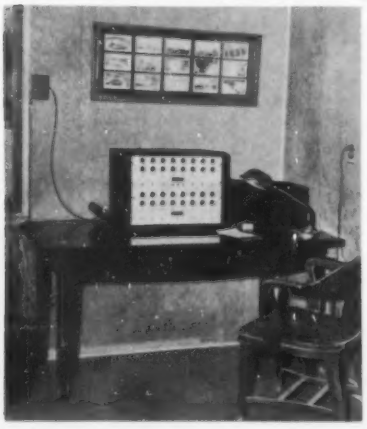
General.—Those dealing with traffic in Atlanta do not say they have a perfect system. They talk, rather, like men working in a shop laboratory, feeling their way toward a perfect system. If some problems are nearing solution, there are plenty of others coming along behind them. This attitude alone inspires the feeling that they have the situation well in hand, and as long as this attitude prevails Atlanta will have an increasingly firm control of traffic.

● **COMPUTER and signal change boxes permit smooth flow of traffic without stops for two miles. W. L. Thomas is at box.**

TRANSISTORS WATCH OVER 13 SEWAGE PUMPING STATIONS

HARLAND N. PHILLIPS
Superintendent of Public Works,
Glen Cove, N. Y.

TO ASSURE 24-hr. protection against mechanical or power failures at its 13 sewage pumping stations, Glen Cove, L. I., has installed a remote control system to give instant warning of any trouble. Consisting of transistorized tone generators and a modular receiver, the equipment automatically signals the central station, located in the office at the new sewage treatment plant, and gives notification of power failure, mechanical breakdown or other abnormal operating conditions at any of the 13 stations. A substantial savings results from the reduction in otherwise necessary inspections; and the prompt notification that there is trouble at a specific station permits repair or corrective work before serious overflow occurs.

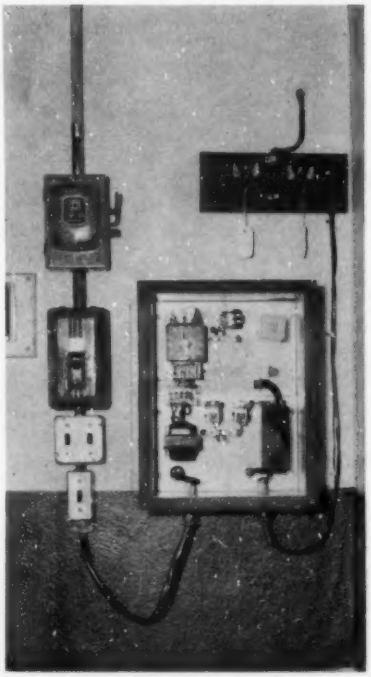


● **INDICATING panel reports operating conditions at the 13 sewage pumping stations throughout the city.**

Because Glen Cove is located in hilly terrain, complete gravity flow to the treatment plant was not possible and it was necessary to install the pumping stations. These operate in the normal manner, the sewage pumps being actuated by the rising sewage in the wet well through a float. The warning equipment, which was furnished by Taller & Cooper, Inc., signals an alarm back to the control station if the pumps fail, a pipe breaks or other mechanical difficulty arises. Moreover, if the power fails or the signal wires are down, a second type of signal is received at the control station. These signals are sent by a transistorized tone generator which has a specific tone for each particular pumping station. This warning tone is picked up by receiving apparatus at the central station, giving instant indication of the nature of the trouble and telling which pumping station is affected. This permits a maintenance crew to proceed to the proper pumping station with some idea of the problem to be encountered.

This system does not require the installation of any special wires throughout the City. Tone signals are carried over existing telephone lines; in one case, one pair of telephone wires services four separate pumping stations. The rental charges for the use of the telephone lines is small.

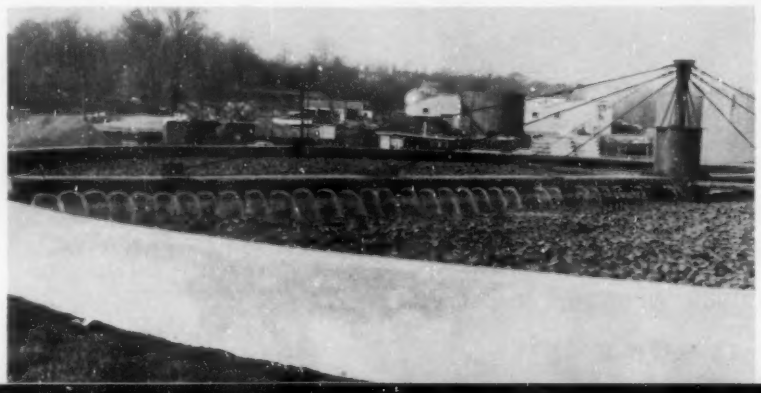
A city of about 20,000, Glen Cove has, over the past two years, constructed a modern sewage treatment plant as well as installing its system for remote supervision of sewage pumping plants serving its 55 miles of sewer lines. The consulting engineer, C. McCallum, remodeled and rebuilt the old sewage plant. New primary settling tanks were constructed; a two-unit Biofilter was built to provide secondary treatment; the old primary settling tanks were remodeled to provide secondary settling; and two-stage digesters were added. Grit removal, comminution, pre- and post-chlorination, vacuum filtration and measuring and recording apparatus were also included. The plant has a capacity of 3 mgd. The effluent is pumped about a mile to a discharge point in Hempstead Harbor.



● **FIELD station transmitter contains tone generators and associated control equipment and time-delays.**

The mayor of Glen Cove is Joseph A. Stanco; Robert H. Davis is commissioner of Public Works; and the author is Superintendent of Public Works.

● **TWO-UNIT Biofilters provide secondary treatment at Glen Cove sewage plant.**



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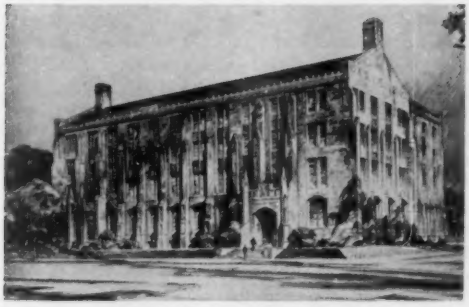

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Street Excavation Problems

Los Angeles, Calif. — Over 100 members participated in ten discussion groups at the last meeting of the Southern California Chapter, which was held at the Rodger Young Auditorium in Los Angeles, California. Frank E. Randall, Right-of-Way Superintendent for the Pacific Telephone and Telegraph Company, was Moderator of a panel consisting of the group leaders who summarized the viewpoints expressed at their respective sessions.

The conferees agreed that the flooding of backfill material on the bottom of the trench to approximately six to twelve inches above the pipe is probably the most practical method of seating the pipe at the bottom of the trench. All in all, flooding has given very satisfactory results in certain types of soils. In some cases where mechanical tamping has been used and rain water has entered the trench before a surfacing could be applied, a considerable amount of consolidation took place. This tends to illustrate the superiority of the flooding method over the mechanical method as a means of achieving good consolidation.

Whether it be by flooding and rolling, mechanical compaction, vibration—whatever it might be—it was the unanimous opinion of the group that the specifications should be written in terms of the end result, which should be met, rather than the method by which a permittee should meet the end result.

A summary report of the entire meeting, with a discussion of the relative merits of cutting concrete by power tools or saw cut and the methods of minimizing traffic interference and resurfacing pavement cuts, is included in the February, 1957 issue of the APWA News Letter.

Progress Report to President Submitted by Coordinator of Public Works Planning

Augusta, Ga.—The White House recently made public the first progress report of Major General J. S. Bragdon, Special Assistant to the President for Coordination of Public Works Planning, together with a letter from the President commenting on accomplishments of General Bragdon's office since its establishment on August 12, 1955.

The President said he is "gratified" with progress made toward the objective outlined by him fifteen months ago—"that the coordination of Federal Government Public Works planning and cooperation with the States and with local Government bodies be advanced as rapidly as possible."

General Bragdon, in his report, said: "If the objectives of sound planning are achieved, the average citizen would secure his most needed public improvements first. He would get them at less cost. His public officials would avoid the waste of wrongly chosen sites, duplication, unbalanced developments, and the pressure of expediency."

He also reported to the President that three inventories of Federal Public Works have been made, with successive improvements, and that they have now been established as a regular procedure. Federal agencies, he said, have initiated the preparation of standards and criteria for specific functions and the estimating of Public Works needs. An "Intermediate" and a "Major Stabilization Plan" have been developed, including drafts of required legislation. Project designs have also been developed by experts in Political Science and Economics at such institutions as Princeton University and the University of Pennsylvania, aimed at the undertaking of a large comprehensive research program on Public Works planning. Progress made in other fields of activity, such as the formation of a State and Local Advisory Committee on Public Works, were also noted in the report.

In his letter, which was released at Augusta, Georgia, the President said:

"In our country where the Constitution recognizes the proper sphere of State Government and where the independent functioning of our local Governments is retained and fostered, it is especially necessary that truly comprehensive planning be accomplished at and by all levels and that it be oriented with reference to inter-governmental relations in order to secure sound integrated development. This will be helpful in assuring and preserving the proper division of responsibilities among levels of Government."

San Diego-Imperial County Meeting Features Talks on Employee Relations

San Diego, Calif.—Over 60 members and guests attended the last meeting of the San Diego-Imperial County Chapter of the American Public Works Association, at the Mission Valley Inn in San Diego.

OFFICERS: Robert Anderson, Winnetka, Ill., *President;* Sol Ellenson, Newport News, Virginia, *Vice President.* REGIONAL DIRECTORS: (three year terms) Albert G. Wyler, New Orleans, La.; Wm. D. Hurst, Winnipeg, Manitoba, Canada; Frederick Crane, Buffalo, N. Y.; (two year terms) Jean L. Vincenz, San Diego, Calif.; Leo Flotron, Dayton, Ohio; Roy W. McLeese, Salt Lake City, Utah; (one year terms) K. K. King, Phoenix, Arizona; Charles W. Cooke, Hartford, Conn.; R. V. Moschell, Alcoa, Tennessee. *Immediate Past President,* Edward P. Decher, Newark, N. J. Donald F. Herrick, *Executive Director.*

Chapter President John W. Davis, Assistant Commissioner of the San Diego County Road Commission, presided at the meeting which featured two interesting talks on employee relations. William E. Long, an Executive of the Ryan Aircraft Corporation of San Diego, discussed the human relations phase of the subject and stressed its importance in maintaining harmony and cooperation among the working group. Mort Morehouse, Public Relations Director, Southern California Area, Pacific Telephone and Telegraph Company, was the second speaker on the program and explained how good public relations can benefit any organization that is in the business of supplying products and services to the general public.

Sewage Lagoons Termed Efficient by PHS Engineers

Washington, D. C.—The Public Health Service has announced that it is pushing research into sewage treatment methods for smaller cities in essentially rural areas. Recent investigations by Federal water pollution control engineers in North and South Dakota disclosed one method—the stabilization lagoon—that, under some conditions may reduce the costs of conventional plants providing the same degree of treatment.

Dr. Leroy E. Burney, Surgeon General of the Public Health Service, said expanded investigations are now under way by the Service in Fayette, Missouri, and near Lebanon, Ohio, in a further effort to find ways to reduce costs. The investigators are from the PHS's Robert A. Taft Sanitary Engineering Center in Cincinnati.

Gordon E. McCallum, Chief, Water Supply and Water Pollution Control Program of the PHS, said that controlled experiments in Missouri and Ohio are hoped to develop cheaper and better designs.

The stabilization lagoon is a shallow collection pond where the sewage undergoes treatment by natural, biochemical action, largely through photosynthesis and the action of algae. Data for the 49 Dakota lagoons recently studied showed an average per capita cost of $14.84. The studies were made in Kadoka, Wall, and Lemmon, S. D.; and Maddock and Wishek, N. D.

As a result of experience with lagoons in North and South Dakota, city officials have placed 41 in operation in the former and 32 in the latter State. Throughout the Missouri River Basin there are now 136 such installations, 99 of which treat raw sewage and 37 receive treated sewage. These facilities serve more than 125,000 persons in cities ranging in population from 100 to 11,000 persons.

Michigan Chapter Hears Talk on Inter-County Highway Agency

Detroit, Mich.—A recent meeting of the Michigan Chapter of the APWA featured an interesting talk on the newly organized Inter-County Highway Commission serving six counties in Southeastern Michigan.

Mr. John McKie, Executive Secretary of the new Commission, said it was officially organized on May 16, 1956 under the provisions of Act 195 adopted by the State Legislature in 1955. The goal of the Commission is to develop an efficient inter-county system of expressways, limited access highways and inter-county highways with sufficient rights of way to serve both present and future needs. The establishment of the proper width of highways, he said, before urban development takes place is the key to achieving one of the basic benefits of the commission: namely, reducing the excessive costs of condemnation.

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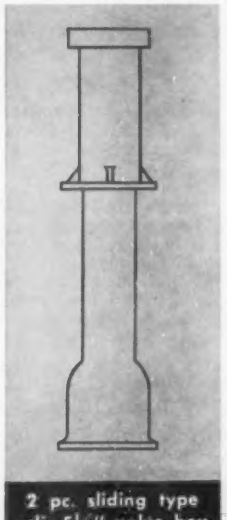
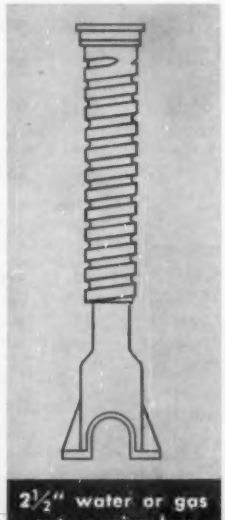
No matter what size, shape or style municipal casting you may desire — you're practically sure to find a "Buffalo" casting to serve your needs. Or, where desired, castings may be made to your own specifications. Whether you need valve, service or roadway boxes, meter boxes, manhole rings and covers or other municipal castings, you'll find all "Buffalo" castings designed for service and dependability.



2 pc. sliding type adj. 5¼" valve box



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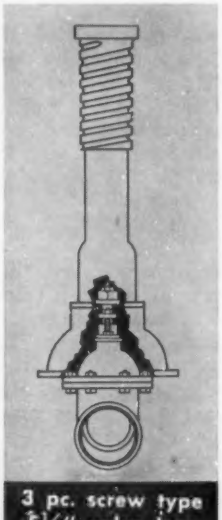

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with spring-bottom bowl, free-swinging light weight valves and "kickless" operation up to 7000 gallons an hour

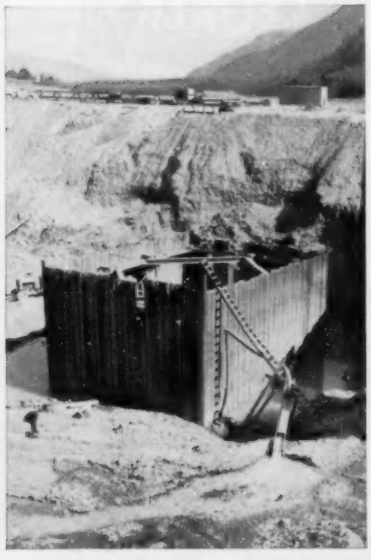
SPRING BOTTOM BOWL (Patents Pending)
Bottom of suction chamber is a heavy reinforced rubber disk, held by compression spring.

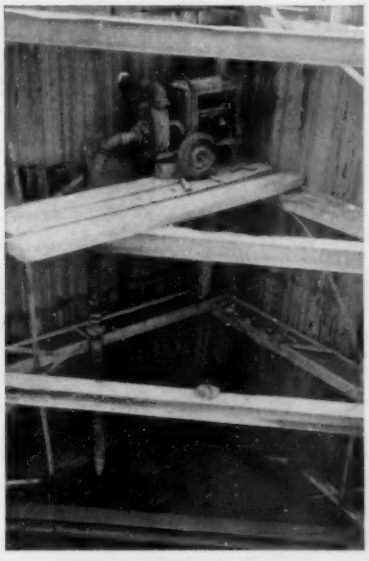
Quick diaphragm change is made by merely loosening 4 bolts and tilting back the pump frame.

HERE IS THE FIRST DIAPHRAGM PUMP WITH A SPRING-BOTTOM BOWL. *Self-cleaning* because the bowl-bottom flexes slightly with each stroke, preventing any build-up of clay or cement deposit. *Shock-absorbing* because the compression spring which holds the bottom yields to protect pump frame and transmission if stones or other objects are sucked into the pump.

Light, free-swinging suction and discharge valves offer minimum resistance and quick closure to an air-tight seat that permits high vacuum pumping (4″ pump handles 4000 gph at 25′ suction lift; up to 7000 gph at 10′ lift). Surge chamber takes "kick" out of suction hose, doubling its life. Built in 3″ and 4″ sizes with heavy duty air-cooled engines, fully enclosed heat treated gears, pinions and shafts.

HIGHER ACTUAL PERFORMANCE ON 1957 JAEGER "SURE PRIME" CENTRIFUGALS





LATEST TESTS of all sizes of Jaeger "Sure Prime" pumps, reproducing actual job conditions, establish higher capacities and performance never before guaranteed to users. For example, the 1957 model Jaeger 6P pump, at 10′ static suction lift, now exceeds 100,000 gph in *actual* performance.

BASE YOUR 1957 PUMP BUYING ON 1957 INFORMATION. Ask your Jaeger distributor, or write today, for the *guaranteed actual performance* of 1957 model Jaeger pumps in the sizes your work requires.

← Discharge of Jaeger 6″ pump from bridge pier cofferdam on Peter Kiewit Sons Co. job on Clark Fox River, near Noxon, Mont.

← Pump working inside the cofferdam. Pier area is 30½′ x 42′ and is near center of river where inflow is heavy.

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You are a CITY INSPECTOR

BENJAMIN C. SEAL
City Engineer,
Kenosha, Wisconsin

Editor's Note: Due to a major turnover of sewer inspectors, and the need for almost continuous training of new men, Mr. Seal prepared a sheet of condensed instructions for inspectors. We believe they will be of value to many other engineers faced with the same problem.

ON YOUR JOB you are the City. What you say, what you do, or what you fail to do, may commit the City as firmly as a signed contract. Always, in the back of your mind, picture yourself giving testimony as a witness in a court of law. Therefore, act fairly and properly in all your dealings. Prepare yourself for your job:

1. Read the specifications and thoroughly familiarize yourself with the plans.

2. In the specifications, look for the addenda. In most specifications addenda have been added and are placed in front of the book. The addenda supersedes any item of the Specification with which they may conflict.

3. Note the Proposal. In this the contractor has bid a price on each item. Be on the alert that your contractor does not start to do extra work for which he has no bid price. If you stand by and say nothing, you may be obligating the City for extra work.

4. Extra Work—According to strict interpretation of the law, the contractor cannot do an extra work order without a written order signed by the City Engineer naming a price for the work. In emergencies, the contractor may be given a verbal order by the City Engineer in order not to hold up the work. In work involving an extra work order, when a price has not been arrived at in advance, you must keep a careful record of the work done and the number of hours employed by each class of labor. Keep a record of hours involving each piece of equipment. Identify the equipment by size. For instance, for a pull shovel, state the bucket capacity ½ cy, ¾ cy, etc. For an air compressor show the

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ALL PURPOSE M-B PACKER

More Calls Each Haul

Most any enclosed sanitation unit available today will compact *garbage* and haul it to the dump — but *only* the M-B Packer is a true ALL-PURPOSE packer body that will handle all types of refuse, all kinds of waste materials, fast — without time-consuming pre-crushing or costly pass-ups.

Just compare M-B Packer design with any other body and you'll see why the M-B is truly ALL-PURPOSE. Huge side doors enable large bulky boxes, crates, cartons, Christmas trees, prunings, leaves, as well as garbage, ashes, etc. to be thrown in, without pre-crushing. And the large loading area can take a big volume before a full compaction cycle is necessary.

For even larger, bulkier materials, the M-B Packer may be loaded through the rear doors, using the full dimensions of the huge van-type body. The compaction plate then compresses the load, leaving room for additional side loading.

No matter what the size of your municipality, there's a place in your sanitation program for the fast, versatile M-B Packer. Your M-B distributor will gladly arrange for a demonstration at your convenience — call him now!

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Versatile "Full-End" Loading

Over-sized cartons, barrels, large tree branches, mattresses and other bulky items are easily loaded through the rear of the unit. The body is also instantly adaptable to general hauling work.

Easy-Access Side Doors

Huge side loading doors can accommodate large boxes, cartons and drums — there's no time wasted pre-crushing boxes or crates before loading.

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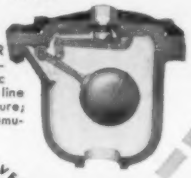
... keep pipelines open

for safe, economical operation

Simplified construction, easy accessibility, maximum durability and efficient cost-saving operation *are basic* in every Crispin Air Valve.

Crispin UNIVERSAL AIR VALVES ... positive, full-time air control when line is filled, in operation or emptied.

Crispin AIR & VACUUM VALVES ... permit air to escape as line fills, allow air to enter as line empties.



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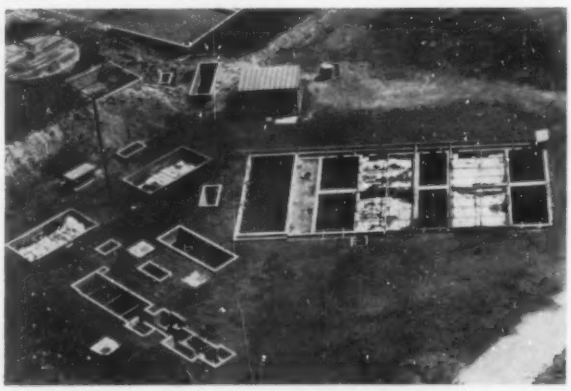


City of McGregor, Texas. Original plant built in 1939, and enlarged to 5,500 population in 1955. Design: 380,000 g.p.d., 0.17 lb. BOD per capita.

IDEAL for SMALL CITIES, SUBDIVISIONS, INSTITUTIONS

8 outstanding advantages make it to YOUR advantage to investigate Hays Process first.

Since 1938 A PROVEN PROCESS

HAYS PROCESS COMPANY P. O. Box 768, Waco, Texas

cubic footage per minute; the capacity is on the name plate; show bulldozer types—Caterpillar D-7, etc.

5. Be on the alert for changed conditions, that is, conditions other than those shown on the plans. On a recent job calling for standard strength pipe the inspector noted that the sewer depths were running deeper than shown on the plans. He called the City Engineer and extra strength pipe was substituted. His alertness may have saved the City thousands of dollars for pipe replacement and the embarrassment which would accompany a failure.

6. Where sewer pipe passes over hard and unyielding objects, such as other sewers, water or gas mains, etc., order a concrete cradle. The same applies to pipes which pass closely over a sewer. Pipes have been known to break due to settlement of surrounding earth when part of the pipe can settle and a point of the pipe cannot settle due to a hard object underneath.

7. Looking at pipe from the top of the trench is not enough. Look into the pipe frequently with a spot light. You may see: (A.) The pipe settling out of line; (B) joint material squashing out of the bells; or (C) broken pipe.

8. On every job a proper allowance has been made for class "D" concrete, sand backfill or stone for sewer cradles. If in your opinion, any of the above are needed, order them put in.

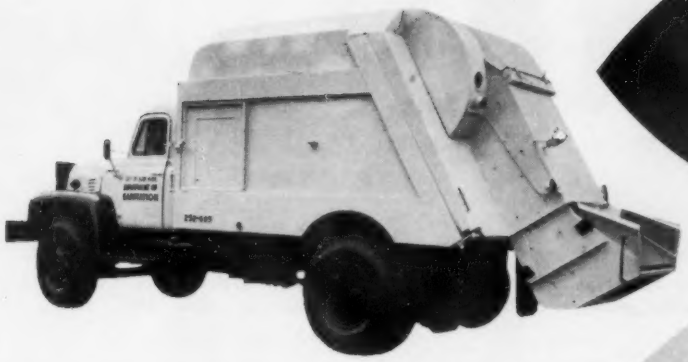
9. A stone sewer cradle should be used where soft foundations are encountered. Put in enough to provide an unyielding foundation, keeping in mind however that sewers do not need the foundations required of a building or a bridge.

10. Do not permit the contractor to place work contrary to specifications. When such work has been installed, it is difficult or impossible to get it remedied. It causes embarrassment to the Engineers and loss of money to the Contractor. Often it causes litigation.

11. If a contractor is permitted to do poor work, you are penalizing the *good* contractor who didn't get the job. Dr. Sam Johnson once said, "When crooks are unpunished, the innocent suffer."

12. Remember that the City Engineer is only as far away as the nearest phone.

13. When a street is barricaded or the barricade is removed, notify the Police and Fire Departments immediately. And when street surface has been cut, notify the Street Department.



for bigger payloads

lower collection costs

New York City depends on ROTO-PAC

In the world's largest city, every collection unit must operate at top efficiency for maximum economy and maximum service. To do the job, New York depends on ROTO-PAC. Here's why:

First of all, *ROTO-PAC is flexible.* Because of its principles of continuous loading and escalator type compaction, ROTO-PAC units can be assigned to any collection route, handling straight ashes, straight garbage or mixed refuse with equal ease and speed. Even boxes and crates are automatically broken up in the hopper and automatically conveyed into the body.

ROTO-PAC handles bigger daily payloads. It's a matter of record, that ROTO-PAC collects 3 refuse loads in the time it collects 2 loads with rear-door compaction-type units. ROTO-PAC's automatic and continuous compaction eliminates the time lost by old-fashioned units with separate loading and compaction cycles.

ROTO-PAC requires less maintenance too. New York City tests have shown that in a nine-month period, ROTO-PAC units lost only 1.8% in down-time, compared to 19.5% lost in down-time by batch type units. That's dependability.

These facts, and many more, are in the public record. They are the reason why New York City has re-ordered ROTO-PAC. And, like New York, so have many other cities large and small, all over the country. Before you decide on any collection unit, you owe it to your community to investigate the advantages of ROTO-PAC. Write today for arrangements about a demonstration.

FREE
"HOW TO CUT THE COST OF REFUSE COLLECTION"
An informative folder that's yours for the asking. Write or phone for Bulletin 37.

CITY TANK CORP.
53-09 97th Place, Corona, N. Y.
Sales and Service in All Principal Cities

● 1909 MARKED first "motor" grader—a light farm-type tractor attached to a small horse-drawn model Galion grader.

● TODAY'S T-700 Grade-O-Matic grader weighs 40,125 pounds; has torque converter, power shift transmission.

GALION IRON CELEBRATES FIFTY YEARS

of Manufacturing Roadbuilding Machinery

FIFTY YEARS ago American highway building was in its infancy. In the ensuing five decades it developed into a mighty industry, with a vital role in making America the strong nation on wheels that we know today. A company born of those days was The Galion Iron Works & Mfg. Company, organized in 1907 at Galion, Ohio, by D. C. Boyd. Galion developed a close association with the road construction industry which has continued through the years. Today, Galion is the world's largest producer of road rollers and one of the leading manufacturers of motor graders, with five plants in the United States and foreign countries plus a world wide net of distributors.

In celebration of their Golden Anniversary, The Galion Iron Works held a four-day open house January 23-26. In addition to Galion distributors, many other company friends attended the event held in Galion's new Sales and Service Training Center. This new building includes banquet facilities, separate club and school rooms.

No other filtering medium compares with

ANTHRAFILT

Trade Mark Reg. U. S. Pat. Off.

Anthrafilt stands alone as the one Filtering Medium that is best for all types of filters

Years of efficient and economical use in every type of filter plant has made ANTHRAFILT the standard of excellence in the filtering medium field.

ANTHRAFILT

offers important advantages over sand and quartz

DOUBLES length of Filter runs • REQUIRES only half as much wash water • KEEPS Filters in service over longer periods • INCREASES Filter output with better quality effluent • GIVES better support to synthetic resins • PROVIDES better removal of fibrous materials, bacteria, micro-organic matter, taste, odor, etc. • IDEAL for industrial acid and alkaline solutions • EFFECTIVE filtration from entire bed • LESS coating, caking or balling with mud, lime, iron, or manganese.

IDEAL FOR USE IN EVERY TYPE OF FILTER

Write for further information, test samples and quotations to:

PALMER FILTER EQUIPMENT CO.

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Anthracite Institute Bldg., Wilkes-Barre, Pa.

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ENTERPRISE

-the engine with built-in quality!

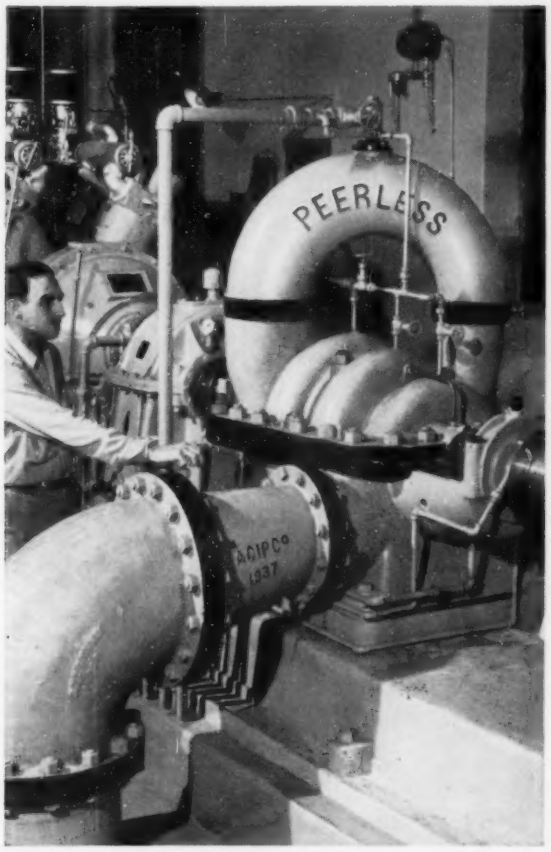
ENTERPRISE ENGINE & MACHINERY CO.

18th and Florida Sts., San Francisco 10

Sales and Service in Principal Cities

Dependability in action

THIS 20 YEAR OLD VETERAN HAS PUMPED 1,000,000 GALLONS A DAY EVERY DAY WITHOUT REPAIRS



No wonder the city officials and the 12,000 citizens of Boone, Iowa like this Peerless pump. For dependability and economy it has established a remarkable record rarely matched in municipal water pumping service: it has pumped a million gallons of water every day for 20 years *without repairs*. The only pump maintenance required has been the replacement of stuffing box packing and periodic lubrication.

At Peerless Pump we think this installation summarizes all the reasons for specifying and installing Peerless vertical and horizontal pumps. We assure you: if you want unexcelled performance, matchless economy, sound design, skilled construction and expert installation service Peerless is the line from which to specify *all* your needs for pumps.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Factories: Indianapolis 8, Indiana and Los Angeles 31, California
Offices: New York; Indianapolis; Chicago; St. Louis; Atlanta; Lubbock, and Plainview Texas; Fresno; Los Angeles; San Francisco; Phoenix; Albuquerque.
Distributors in Principal Cities. Consult your local Telephone Directory.

HERE'S THE RECORD

TYPE: Peerless Type TU; 2-stage horizontal pump.
OPERATOR: City of Boone, Iowa.
LOCATION: Des Moines River.
INSTALLED: 1937; in continuous operation for 20 years.
SERVICE: Supplies 90% of City of Boone, Iowa, water supply.
CAPACITY: 2000 gpm.
HEAD: 485' TDH.
DRIVES: Dual power drive; GE electric motor, Le Roi engine.
MAINTENANCE RECORD: No shutdowns for repairs. Replacement of packing and lubrication only maintenance performed.

PEERLESS PUMPS

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
301 West Avenue 26, Los Angeles 31, California

fmc

☐ Please send Type TU Pump Bulletin No. B-1400

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

PW

Over the years Galion has built horse-drawn scrapers and drags, sprinkling wagons, stone and chip spreaders, screening plants, rock crushers, unloaders, conveyors and earth movers—but always their main endeavor was the designing and manufacturing of road rollers and graders. Galion was a pioneer in the development of the steam-driven tandem and three-wheel rollers (and later the gasoline-engine driven roller) as well as pull-type and motor graders. Today, Galion is a company devoted entirely to designing, engineering, and building a complete line of road rollers including twenty-three models or weights from 3 to 20 tons; and eight models or sizes of motor graders ranging in power from 50 to 190 horsepower.

Typical of Galion's role in the road construction industry, is the recent introduction of their Grade-O-Matic grader and Roll-O-Matic roller lines. Heading the Galion Grade-O-Matic line is the model T-700. This 190 hp grader weighs more than 20 tons and features a torque converter, power-shift transmission with tail-shaft governor, hydraulic controls, manual steering with hydraulic booster, and balanced weight to horsepower for the utmost in ease of operation and working efficiency.

A torque converter drive with tail-shaft governor also features the Galion Roll-O-Matic line of rollers, which includes both tandem and three-wheel models. Galion recently doubled the roller manufacturing and assembling capacity of their Bucyrus, Ohio, plant. This expansion comprises seven acres of land and buildings which provide 200,000 sq. ft. of additional floor space. Their entire roller production is now centered in the Bucyrus plants.

Galion's 289 distributors, the majority of which attended the 50th Anniversary celebration, represent the strategically placed company outlets in the United States, Canada, and foreign countries all over the world.

• • •

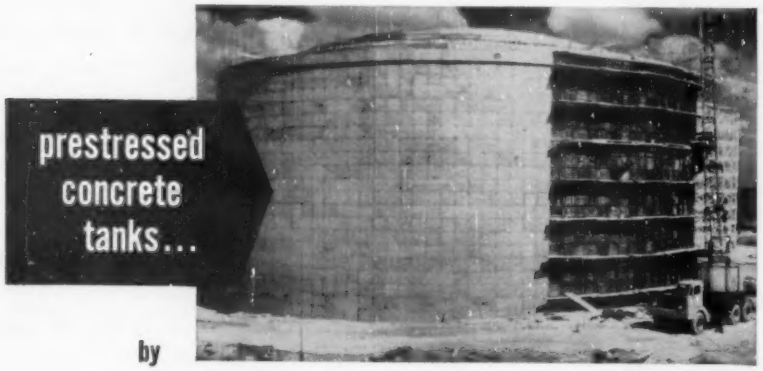
Sewer Infiltration Cut by Chemical Grout Technique

Injection of a chemical grout has eliminated excessive ground water seepage into a 2,000 ft section of 18 in. vitrified clay line in Hollywood, Fla., while the line remained in full and continuous operation.

This new technique, which promises to solve the problem, has the following advantages: (1) Work can be performed from the surface, without excavation; (2) no interruption of service is necessary; (3) paving above the sewer need not be disturbed; and (4) cost is less than other methods.

According to the Chemject Corporation, 3521 No. Cicero Ave., Chicago 41, Ill., the first step in the procedure is to locate the leak on the length and periphery of the pipe. Once this has been done, an injection point is jetted or driven at the proper location and elevation adjacent to the point of infiltration. The setting time of the Chemject grout is controlled so that gelation will take place as the grout begins to pass through the leak. The injected grout penetrates the soil adjacent to the pipe and upon gelation renders the entire mass impervious. In the case of extreme infiltration where a sizable void has been created adjacent to the leak, a quantity of properly sized aggregate is placed before grouting.

After grouting at 20 locations in the Hollywood, Florida, sewer system, a marked decrease in invert flow was observed.



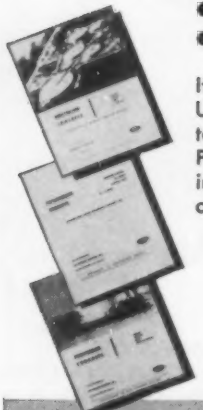
by

PRELOAD

TRADE MARK

One of two 5 million gallon reservoirs, 126' I.D. x 54'-4" S.W.H., under construction for Philadelphia Suburban Water Company, Wayne, Pa.

- Economical First Cost
- Maintenance Free
- Long Life Expectancy
- Architecturally Pleasing
- Big Jobs . . . Small Jobs



If you are planning for Water Tanks, Stand Pipes, Underground Reservoirs, Sludge Digestion Tanks or tanks of any type, be sure to check on the possibilities of a Prestressed Concrete Tank. Today's most modern installation takes advantage of the many economies offered by Prestressed Concrete Design.

WATER TANKS . . . Send for Bulletin T-12
SLUDGE DIGESTION TANKS . . . Send for Bulletin T-7
INDUSTRIAL TANKS . . . Send for Bulletin T-15

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Driving form pins on the New York Thruway near Fultonville, New York.

Drilling rock for blasting on the northeastern extension of the Pennsylvania Turnpike, Quakertown, Pa.

Le Roi Tractair "plugs the leaks" in new highway construction

Versatile low-cost tractor-compressor keeps expensive major equipment rolling

Idle big equipment drains off profits. Every hour a dozer, shovel, or paver sits around waiting, it means capital investment down the drain.

Low-cost Tractair is a fast-moving source of airpower that moves quickly from site-to-site with its own tools. Its usefulness is further increased by a wide range of attachments like back hoe, front-end loader, and dozer blade, that give Tractair big-equipment usefulness without "big-ticket" costs!

Tractair can stay in front of big equipment, prevent delay. It can roll up to a rock face and drill in a round so shovels can load out, dozers and graders swing in to blue-top grade; power jack hammers on a street-repair job or run along driving form pins to speed pavers.

You don't tie up a truck to move your compressor. No investment leak there. Tractair moves alone—saves you about 50% of the cost of a truck *and* compressor normally needed. Tractair stamina pulls it through thick mud and over slippery ground — places that a truck couldn't go. Tools, operator, and power source, roll up to work ready to go all day, all weather.

Tractair is the one piece of equipment that is never idle. With its many tools and attachments it serves as a reserve labor gang, limited in usefulness only by your ingenuity!

See Tractair at your Le Roi Distributor. You'll quickly see how a small investment here keeps big equipment rolling on the big road jobs. T-71

Loader-equipped Tractair powering jack hammer on Major Deegan Expressway, Bronx, New York.

LE ROI

Division of Westinghouse Air Brake Co., Milwaukee 1, Wisconsin, manufacturers of Cleveland air tools, Tractair, portable and stationary air compressors, and heavy-duty industrial engines. Write us for information on any of these products.

LOW COST OILED ROADS

R. H. JUSTEN,
Johnson County Engineer,
Iowa City, Iowa

HIGHWAY MAINTENANCE and construction problems are no doubt about the same in Johnson County, Iowa, as in dozens of other Counties in the middle west. Our county has a population of about 45,000 with a unique situation in that approximately 32,000 are living within a radius of three miles of the heart of Iowa City, the county seat and home of the State University of Iowa. The area is 611 square miles, and there are 1100 miles of roads of all classifications, of which 1007 miles are secondary roads.

We have 741 miles of stone and gravel surfaced roads and this large mileage poses a maintenance problem which has been aggravated by the fact that maintenance funds have not kept step with construction progress. It has been our experience that, in order to keep a stone or gravel road in "good" condition, the road should be resurfaced with about 400 tons of replacement stone every three years. This means that, with our present mileage of stone surfaced roads, approximately 250 miles should be resurfaced each year. This would take 100,000 tons of rock per year with an expenditure of about $175,000 for replacement stone alone. This would represent about 60 percent of our total maintenance budget. We cannot use that much money and still do all the other maintenance work that is necessary.

Much of the surfacing material on a road is lost by blowing away, getting thrown off by traffic, bladed off in winter when snow is removed, etc. It seemed that the answer to our problem would be to keep as much as possible of the surface material on the road and not let it get lost.

We set up a three-year construction program which included approximately 238 miles of oil-mix roads. Of this amount, 95 miles are on the County Trunk system and 143 miles on the local secondary roads. On the County Trunk roads it was decided to build by stage construction: Sealing the surface the first year and giving the road the final mix the second year. By doing this the main roads would be given a dustless surface faster than by giving both treatments at once. However, on the local roads the mixing is done all at one time.

During the summer of 1956, 30.32 miles of roads were given the seal treatment, at an average cost of $1630 per mile. The following procedure was used: The surface of the road was given a tight blading to remove all loose material, then was shot with 0.35 gallon psy of SC-O material. This oil was allowed to soak in, which normally took about 24 hours; then SC-2 material at the rate of 0.25 gallon psy was applied, and blotted out with just enough stone chips or coarse sand so that traffic would not pick up the bituminous material. Traffic does all the rolling.

Also, during the summer of 1956, 73.17 miles of oil-mixed roads were built at an average cost of $3930 per mile. The following was the method used in doing this type of work: The shoulders of the road were bladed and all loose material brought on the road; then the top

KWIK-MIX Bituminous Mixers set up anywhere for economical, one-man handling. Both 10 and 14 cu. ft. sizes are readily adaptable as stationary, elevated plants. Operator controls charging, mixing and discharging without leaving platform. Skip, receiving aggregates from truck at ground level, is raised by power up an extension track to charge drum. Non-tilting drum discharges mixed batch into trucks or hoppers in 6 seconds. Mixers also mount on rubber tires for mobile, on-the-job mixer service. Ask Kwik-Mix distributor for details, or write for catalog.

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Send us literature on: ☐ 10 ☐ 14 cu. ft. Bituminous Mixers
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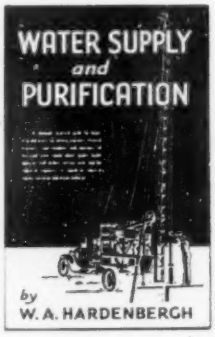
by Col. W. A. Hardenbergh



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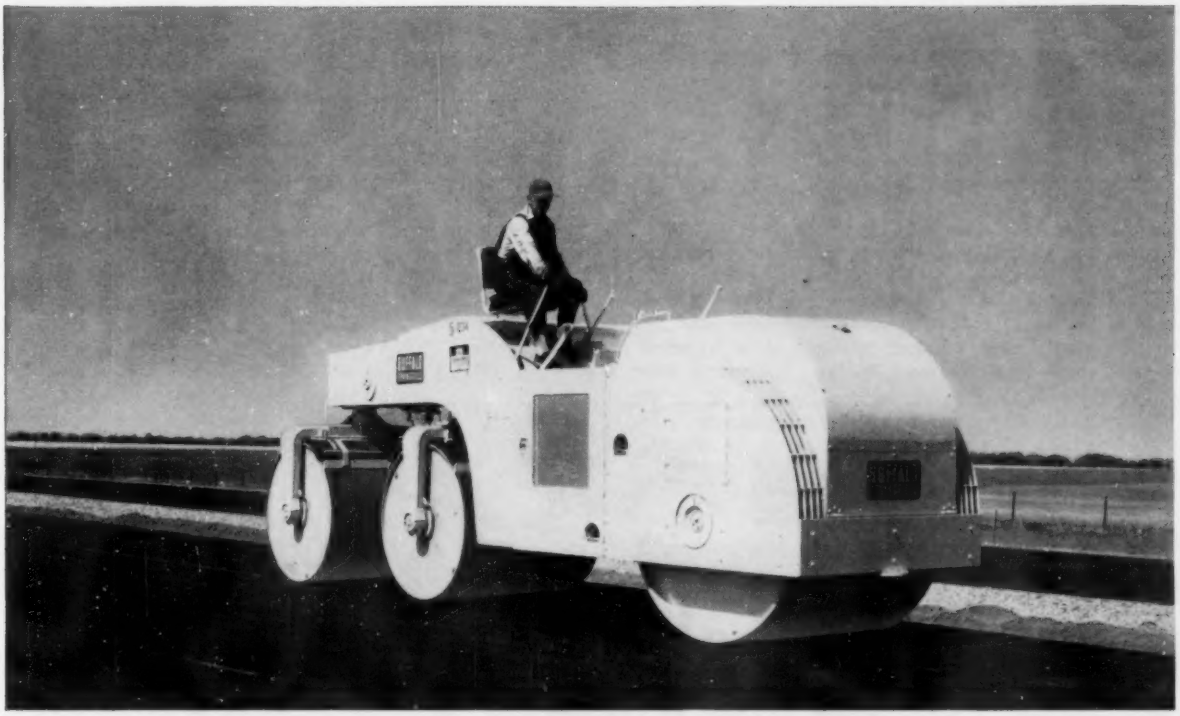
AN authoritative yet simple treatment of the subject by one of the nation's foremost authorities, whose editorial and field work have brought him in close contact with the problems that trouble the average engineer. Design examples of all kinds are worked out in detail to illustrate practical, up-to-date methods.
Among the major changes introduced in this latest edition are the following: the chapters on ground water, on filtration, and on laying pipe and maintaining lines have been almost completely rewritten; the chapters on pipe conduits and on disinfection have been revised to bring the material in them up to date and a new chapter has been added on fluoridation.

Order your copy today

Limited number of copies available in Portuguese.



"EASIEST HANDLING ROLLER" ... says operator

as Buffalo-Springfield "Walking Beam" 3-Axle Tandem compacts Kansas Turnpike for San-Ore Construction

San-Ore Construction Co., McPherson, Kansas, used this Buffalo-Springfield Heavy-Duty "Walking Beam" 3-Axle Tandem Roller with *Complete Compaction Control* to get 99% specified densities on Sections 1 and 2 of the Kansas Turnpike.

Said Earl Robinson, operator: "We're finishing 2¾" asphalt down to 2½", and this roller is doing a beautiful job. There's plenty of power, and the synchronized hydraulic steering makes it the easiest handling roller I've ever run."

To which Charles Nickel, Superintendent, added: "This roller works and operates better than anything we have on the job."

Buffalo-Springfield's 3-Axle Tandem is *the best* 3-Axle Roller because its exclusive "Walking Beam" design and construction permits complete compaction control. There is never an increase in compaction pressure except when and where it is needed . . . on the high spots only! Then, through the "Walking Beam" semi-locked action almost *3 times* the normal compaction pressure of the center roll may be applied to the high spots, providing a leveling action unequalled by any other type 3-axle tandem roller. No need for added cross-rolling time and expense, and consequently no possible damage to material that has been compacted and set. Another feature of the "Walking Beam" action is that all rolls can be released for full floation whenever the leveling action is not desired.

Let your nearest Buffalo-Springfield distributor show you why anything *less* than a genuine Buffalo-Springfield 3-Axle Tandem with exclusive "Walking Beam" Compaction Control is old-fashioned! Ask or write for Bulletin No. S-71-1255.

BEAM, semi-locked. Lead guide roll can rise above but not go below its normal position.

FIRST guide roll encounters "hump" exerting only normal pressure, "prepares" material.

CENTER guide roll rises on "hump," lifts lead roll off ground, exerts triple normal weight.

DRIVE roll follows through with normal pressure. Beam can be locked and unlocked.

The Standard of Comparison

BUFFALO-SPRINGFIELD ROLLER COMPANY

SPRINGFIELD, OHIO

was scarified to a depth of about 4 inches. This scarified material was windrowed and run through a Seaman pulverizer until all was uniformly mixed. This windrow was then split into 2 windrows and flattened out by running it through the pulverizer. SC-2 oil was then added to each of the flattened windrows at the rate of approximately 0.25 gallon psy and the mixing equipment took over. One motor patrol bladed the flattened material on one side of the road; it was followed by a pulverizer; then another motor patrol turned the windrow in the opposite direction; and another pulverizer followed. At the end of the mile, this train of equipment turned around and did the same work on the second windrow.

After each round trip, additional oil was added and the equipment train did the same work again. This procedure was followed until an average of about 14,000 gallons of bituminous material per mile was incorporated. Of course this amount varied with the types of soil encountered; some took more, some less, to bring it to the proper consistency. After all the material was mixed, it was bladed out on the center 22 feet of the roadway, given the proper crown of about 4 inches and left for traffic to roll. After traffic had used the road for several days the outer 2 feet and 2 feet of the shoulder were given a treatment of 0.60 gallon psy of SC-2 material. This gave a good seal and water would not stand at the edge of the mixed material.

After 10 days to two weeks the final seal coat of approximately 0.20 gallon psy over the entire surface was placed. This was applied to half the traveled roadway at one time, so that cars could travel the road without getting spotted with oil. This final seal coat was a blend of SC-O and SC-2; no blotter of any kind was used, and the only rolling was done by traffic. However, toward the end of the season, when we had quite cool weather, we did add a little sand in order to hurry the drying time.

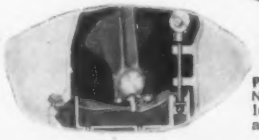
L. L. Pelling of Williamsburg, Iowa, had the contract for furnishing, heating, hauling and applying the oil on the various roads at a time and location as directed by the Engineer. He also furnished an experienced motor grader operator to do the final spreading and shaping. The cost to the County for the above was 16¾ cents per gallon of oil used. County forces did the scarifying and mixing of the material. The price of $1630 per mile on the seal coat jobs and $3930 per mile on the mix jobs includes all costs of material, labor and equipment used.

One mile of the oiled mix roads that we put in during the season of 1955 became wavy and corrugated in spots, so we scarified this mile and ran it through the pulverizer and relaid it without adding any oil whatsoever. Now this particular mile looks as good as the roads we built this summer. The total cost for labor and equipment on repairing this mile amounted to $130 which was the entire amount spent on this mile for a year.

We haven't been oiling roads long enough to get a long time maintenance figure, but I am sure that a very substantial saving will be made and that the traveling public will be using a much safer road: and the people living along the road will be able to have their windows open in the summer if they so desire.

This is part of a paper presented by Mr. Justen at the County Engineer's Conference held in Ames, Iowa, in December.

EXCLUSIVE TAPERED ROLLER BEARINGS AT BOTH ENDS OF DROP-FORGED CRANKSHAFT . . . Main bearing failure just doesn't happen.



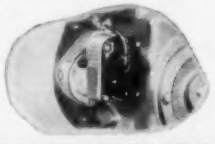
POSITIVE OIL PUMP LUBRICATION SYSTEMS NEED LESS WATCHING . . . Provide surest lubrication . . . even when oil is at a very low point.

WISCONSIN ENGINE-POWERED EQUIPMENT

When a mower is built to last . . . *meant to last* . . . it does better work with less effort, saving you on-the-job manhours. And since the mower is rugged throughout, your operator spends less time in servicing. These are well-known facts. And you'll note that manufacturers who are building equipment with quality in mind are specifying Wisconsin Heavy-Duty Air-Cooled Engines for power in increasing numbers . . . rugged, dependable, built to last, *meant to last.*

Write for handy service map S198 pinpointing our service organization.

WISCONSIN MOTOR CORPORATION
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines



EXCLUSIVE MAGNETO MOUNTS OUTSIDE WHERE SERVICING IS EASY . . . Incorporates an impulse coupling that delivers faster all-weather starts.

2,000 SERVICE STATIONS . . . SEVERAL NEAR YOU

A7-6069-½1

POWER Aplenty

for MANY JOBS...at NEW LOW COSTS

JOHN DEERE
Crawler Tractor

Compact, powerful, and low in first cost, the "420" Crawler is built to deliver years of dependable service at very low cost per hour. Ruggedly built. Easy to start. About 30 engine horsepower. Fewer parts to wear, easily serviced, very low fuel consumption. Your choice of 4- or 5-roller frame . . . track shoes to fit your needs. Optional equipment includes smooth, fast-working single or double hydraulic system, direction reverser, new 3-point hitch for rear-mounted equipment, and 5-speed transmission. Wide choice of matched working equipment for nearly all jobs, including John Deere Loader, at left.

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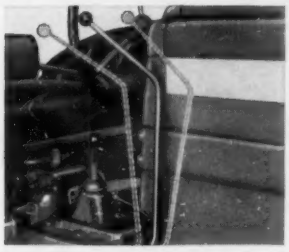

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How to give a Speech

L. A. KEATING

ANYONE who wants to and has something to say can give a good speech, declares Professor Lynn Surles, director of Business and Professional Speaking at Marquette University, Milwaukee. Therefore, unaccustomed to public speaking as you probably are, if you will use a few basic techniques, you can acquit yourself well next time you have to "talk on your feet."

You will be nervous, of course. Even speakers of long experience perspire, fidget and shake before they get under way. But the more you prepare in advance, the less nervous you will be. Too, there are ways to combat nervousness.

"First, understand nervousness," urges Professor Surles. "It is nature's way of keying you up to meet a challenge. You can get the upper hand on nervousness in two ways: by relaxation and by taking plenty of time.

"There is a psychological help, too. While the chairman is introducing you, say to yourself, They're asking for this, so let the audience be nervous."

When your name is called, rise from your place as relaxed as possible and take plenty of time. On the platform as you look over the audience, think about relaxing—your neck, your shoulders, your arms. See to it that your hands are limp on the podium. Stand there taking plenty of time. Your audience will wait. As you realize how patient and expectant they are, you gain confidence and confidence erases tension.

Sure you are ready now to begin? State your opening line and pause. Say another line. Pause and look around. These pauses will calm you and are dramatically effective in gripping your hearers' attention. Actually, the pause is as effective as the words you speak. As you make successive statements you will pick up speed and confidence, and as you notice the attentiveness given you, nervousness is forgotten.

Here is a trick about looking at your audience. It is dangerous to pick out individuals and watch their faces to see how you are doing. Shun this! Do not see anyone individually. As you talk, slowly sweep your gaze along the last rows of the audience. Keep doing this, and every person facing you will believe you are looking at him.

Start in low gear, offering earnestness and sincerity. Your enthusiasm will rise and carry you to the needed heights in good time. Remember, your greatest impact is made with earnest understatement, followed by a pause. Never yield to excited exaggeration.

Gestures? Don't push them or experiment or imitate. Just do whatever comes naturally.

Now let's go back to preparation of your speech—because an audience worth talking to is worth doing your best for. Never read your speech: that puts people to sleep. Of course, you may have to read brief technical passages or quotations; but reading takes your attention away from your listeners. Never memorize your speech because if you forget two or three lines you may be headed for disaster.

The best approach is to know what you want to say. When the time comes, you will find words for saying it. Jot down on a card or sheet of paper the list of topics you want to cover. Be sure their sequence is logical and effective. Place your card on the podium where you can see it but your audience can't. Discuss your first subject and stop. Take up your next subject. When you have discussed your final point, wait four or five seconds, then leave the podium.

What if someone heckles you? It's risky to attempt matching wits; you may lose and look foolish. Instead, take a step or two his way and gaze at him in silence. Then turn back and resume your talk.

"Use all the anecdotes you can that illuminate the points you wish to make," Professor Surles advises. "Anecdotes reveal people in situations, and audiences love them. Ninety percent example material and 10 percent of your own opinions will hold listener interest. Later, people will forget your assertions but remember your anecdotes. Get used to saying, 'When this point came up at another meeting—' or 'Here is a case I encountered—' or 'Let me illustrate with an experience I had.' "

To sum up: prepare your speech by making a list of subjects you can jot down on a small card. When the chairman introduces you, fight nervousness with deliberation. Speak slowly, with frequent pauses. Look at the mass of faces, never at individuals. When you have finished what you planned, never repeat or re-emphasize or go on. Wait a few seconds, then return to your seat.

Should you be called upon with little or no warning, use this three-point formula, which is sure-fire if you know your field.

#1. Stand up, relaxed, and say, "Gentlemen, here is how this matter seems to me." Or, "Here is the point I wish to make." State in one sentence, or as concisely as possible, the idea you wish to put across.

#2. Next, say, "Let me give you an example." Relate an apt ancedote in your best story-telling manner. Give names to your characters and quote them. Keep it brief.

#3. Lastly say, "Here is what I believe we should do." State your proposal in simple terms. Remain standing three or four seconds: the silence will help drive your point home. Go back to your seat.

Or, say you are called upon unexpectedly and you are puzzled as to what to tell this group. In the moments you have to think, ask yourself, How can I help them? The answer is what you should talk about.

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COMPOSITION AND PROPERTIES OF CONCRETE

This book includes information on the control of concrete making and concrete construction; the materials of concrete; and the desirable and undesirable characteristics of concrete. Part I is a descriptive text which covers the characteristics of cements, aggregates, admixtures and water used in concrete mixes, the proper proportioning of these materials (with examples), and the batching, mixing, placing and curing of the concrete to produce a finished product of suitable and predictable quality and economy. Part II comprises instructions for laboratory tests selected to illustrate the most important facts and principles connected with the use of cement, aggregate and concrete. The authors are George Earl Troxwell and Harmer E. Davis, Professors of Civil Engineering, University of California. Publishers are McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 36, N.Y. Price per copy is $7.75.

CULVERT-FLOW CHARACTERISTICS

This bulletin contains two papers on flow characteristics of culverts. The first, "Demonstration of Possible Flow Conditions in a Culvert," by M. R. Carstens and A. R. Holt, illustrates by a series of photographs most of the typical water-surface profiles which can occur in a culvert. The second paper, "Tests on Circular-Pipe-Culvert Inlets," by R. E. Schiller, Jr., reports on tests which were performed on model culverts with a number of standard inlet conditions and includes design charts. Copies from the Highway Research Council, 2101 Constitution, Washington, D.C., are 60¢ each.

SECTIONAL PROPERTIES OF THE CIRCULAR FRACTIONS

"Sectional properties", as the term is used in stress analysis, include the area, the location of the centroid, the moments of inertia about two perpendicular axes, and the product of inertia about these same axes. The section modulus and radii of gyration may also be wanted, but they can readily be found from the first four properties. This handbook consists of tables that shorten the labor of computation for finding the sectional properties of the circular fractions. The author is Monroe Ames and the publishers are Exposition Press Inc., 386 Fourth Ave., New York 16, N.Y. Price per copy is $5.

SIMPLIFIED PROBLEMS IN STRENGTH OF MATERIALS AND DESIGN

This is an all-problem reference book prepared for the structural engineering field. The book is in three parts and has twenty-two subject headings. Questions on each subject are presented, then problems on that subject stated and solved in step-by-step fashion. All questions and problems are arranged on a theoretical and practical basis, and answers are provided for each problem solved. There is a total of 735 problems. Working engineers will find this a valuable book, as will students, architects and engineers preparing for their State license examinations. The publishers are

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Arco Publishing Co., 480 Lexington Ave., New York 17, N.Y. Author is Ephriam Viertels and price per copy is $5.

CONCRETE CONTROL AND CONSTRUCTION

This bulletin contains four papers, on concrete control and construction. In the first paper, entitled "Quality Concrete for Highway Construction with Central Mixing Plant," Glenway Maxon discusses present and needed equipment of this type. The second paper, by Robert H. Tittle, covers the development of "Self-Propelled Machines for Unformed Concrete Slab Construction in Illinois." The third paper, by William E. Grieb and Robert A. Marr, Jr., is "Use of the Kelly Ball for Field Measurement of Concrete Consistency." The fourth paper is "Sawed Joints in Concrete Pavements: Progress and Problems." The author is E. J. Coppage, Jr. Copies from Highway Research Board, National Research Council, 2101 Constitution, Washington, D.C., are 75¢ each.

• • •

Work of a Street Cleaning Department

The Division of Street Cleaning, Raleigh, North Carolina reports that there were 11,178 curb miles of streets swept, 3,870 sweeper dumps, 9,482 miles of streets flushed, 15,100,640 gals. of water used for flushing, 7,006 loads of trash and tree trimmings hauled and 551 catch basins cleaned during the fiscal year ending June 30, 1956. The total operational cost of this department, including maintenance, repair and depreciation of equipment and labor amounted to $83,155.68. These data appeared in Raleigh's Annual Report.

• • •

Data On Parking Surveys

More than 100 cities in 35 states have made comprehensive surveys of their respective parking problems in the interest of relieving traffic congestion. Such studies have provided information on not only the adequacy of parking facilities but also the factors which influence motorists in seeking parking facilities. The procedures for such a study have been developed by the Bureau of Public Roads in a parking study manual, which is not available in printed form, but can be furnished to cities seriously considering making a comprehensive study.

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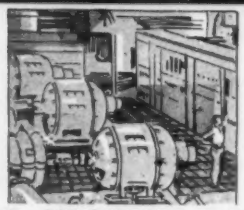

PUBLIC WORKS DIGESTS

THE WATER WORKS DIGEST

Controlling Evaporation Loss from Reservoir

Forth Worth, Texas, gets its water supply from Lake Worth, constructed in 1914. In 1934 a dam was constructed up stream to develop Eagle Mountain Lake. This upper lake intercepted most of the silt washed from the watershed. By controlling the flow from the upper lake to Lake Worth, the water elevation in that lake was maintained at 589 to 591. When the water was raised from 589 it flooded hundreds of acres of flat shore temporarily on which had grown marsh grass and other semi-aquatic growth. This, by transpiration, consumed thousands of gallons of water. This loss of water was prevented or lowered by reducing the area of shore so uncovered intermittently. The river channel through the low areas was straightened and shortened and levees built along its banks and short dams across side channels. Altogether the areas of shallow water or swamp was reduced by about 830 acres; and the loss of water was estimated to have been reduced by 4980 acre-feet. The value of the water so saved annually was calculated to be $16,235. The cost of this improvement was about $10,000.

"Shore Line Correction Aids Reservoir Evaporation Control." By Uel Stephens, Director, City Water Dept. PUBLIC WORKS, February.

Basin-Wide Study Of Future Water Resources

An exhaustive study is being made of the water resources of the Missouri River basin, with a view to learning the possibilities of meeting future demands for water, both as to quantity and quality. This study emphasizes the need for similar ones in all other areas of the country. This requires a more definite and reliable knowledge of available run-off of surface water and capacities of underground supplies. It was found, that, in the Missouri basin, the sources now supplying a third of the present consumption may be inadequate in 20 years. Surface sources serving 70% of the present surface water demand convey sewage and industrial wastes. There is need for long-range planning to learn how to meet future increased demands. This requires obtaining many more basic data, such as stream gauging, ground water explorations and quality analyses; also greater familiarity by water works officials with the sources of municipal supplies. Basic data collection must be expanded and maintained over long periods of time to develop adequate records.

"Basic Municipal Water Supply Data For Missouri Basin Resource Planning." By Ralph Porges, of Robert A. Taft Sanitary Engineering Center. PUBLIC WORKS, February.

Backfilling and Soil Mechanics

The work of excavating and backfilling trenches is affected by the stability of the soil in the sides of the trench and the settleability of the backfill. Soils may be classified as cohesive and cohesionless, such as sand or gravel. Soil properties of interest in trenching operations include strength, volume, change characteristics, permeability to water, and elasticity. Of primary importance as a control item which greatly influences all of these properties is the density of the soil. It is desirable in backfilling to compact it to a density as great as or greater than that of the original soil. The most satisfactory way to densify bulky particles is by vibration in the absence of water films between particles. As it is impracticable to remove these films by drying, the best way is to drown them out and vibrate the soil in an inundated condition. In the case of cohesive soils, the best way to overcome the loose structure is to break it down under applied load, either static or dynamic. Both plastic and nonplastic soils can be compacted satisfactorily by tamping but it is less effective with cohesionless material. In general, a cohesionless material at a slope of approximately 45° is at its steepest possible inclination; but cohesive material can stand with a vertical or even overhanging face. The most important plastic property of a soil is the plasticity index in combination with the liquid limit. The smaller the range between the liquid limit and plastic limit, the greater the effectiveness of inundation; the higher the liquid limit, the greater the necessity for compaction limits.

"Soil Mechanics and Backfilling Practices." By Henry W. Reitz, Prof. of Civ. Eng., Washington Univ. *Jour., AWW Ass'n*, December.

Stabilization of Lime-Softened Water

Afterprecipitation from lime-softened water which would cause filter sand and pipeline incrustation, is usually prevented by recarbonation or by sequestering. This article discussed the removal of supersaturated hardness by contacting the softened water with a slurry bed of calcium carbonate. In laboratory and pilot plant operation, this processing was found feasible. However, a number of important problems have been encountered in a 6-mgd prototype installation. Stabilization of the water in the prototype unit has been possible, but costs have been high because of the difficulties of holding the available calcium carbonate particles within the basin or in suspension. Study and experimentation are continuing, but no predictions can yet be made.

"Calcium Carbonate Stabilization of Lime-Softened Water." By Herbert A. Hartung, of St. Louis County Water Co. *Jour., AWW Ass'n*, December.

Maintenance of Distribution Systems

Tools and methods desirable for use in maintaining distribution systems are discussed at some length by the author. Wages have become so high that a high-priced piece of labor-saving equipment can be a bargain. When work is being done

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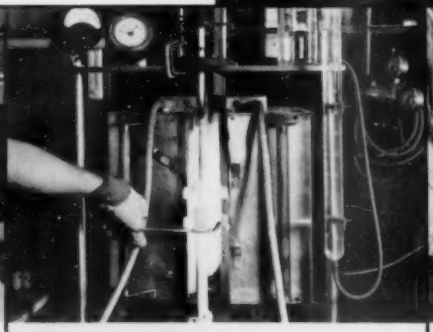
Each Mueller craftsman is instilled with the need for dependable, long-lived equipment in the essential gas and water industry...each does his part to create a product that will fulfill that need. Superior performance is the product of Mueller Co.

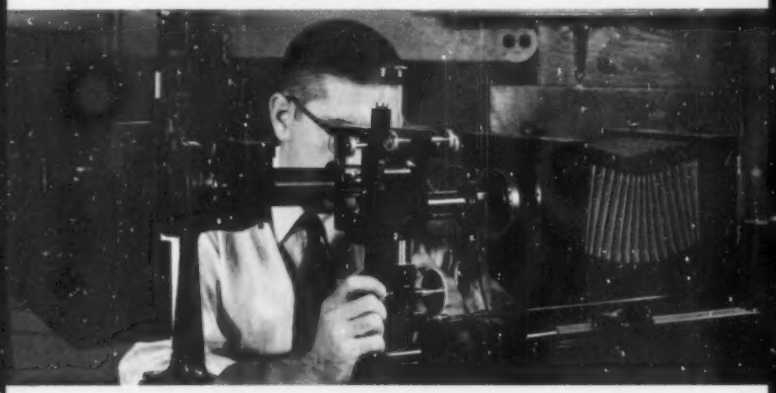
Exacting specifications are established by experienced engineers who know customer requirements and material qualities.



Molding sands are checked by a technician for compressive strength, permeability, moisture content and density, assuring flawless castings.

A semi-automatic machine cuts and threads both ends of a curb stop simultaneously to prevent distortion and damage.

Surface smoothness and contour is revealed by a Profilometer, a precise instrument that helps a corps of inspectors in their work.



The microstructure of raw materials and metal in products are inspected under extreme magnification in the metallograph.

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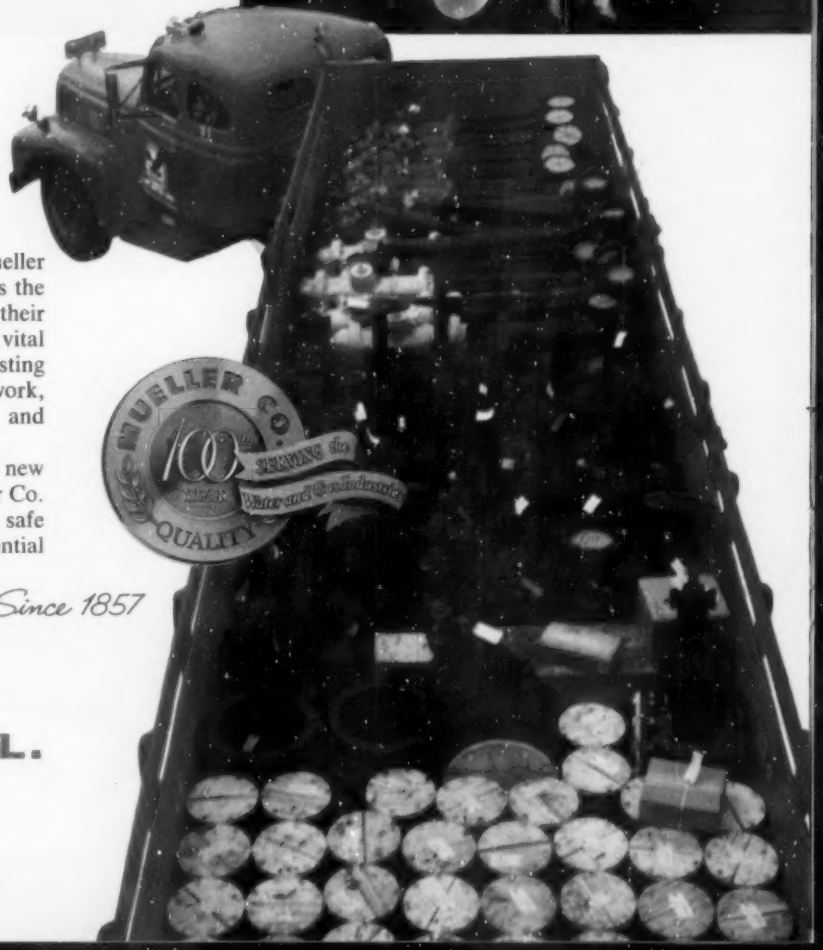

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in congested streets any reduction in job time will minimize inconvenience to the public. Tools generally result in better working conditions, reduce the physical efforts needed and create more job interest. Basic tools needed are complete and accurate maps and records. Valves and hydrants should be tested annually, and testing crews work more speedily when using a card system rather than maps. A second basic tool is an adequate communication system, including mobile phones. Next in importance is adequate transportation equipment. Truck-mounted valve openers, air compressors, equipment for handling supplies, trenching and backfilling machines, leak locators, floodlights, portable trench pumps, pipe pushers, mechanical joint repair sleeves, tools for meter maintenance, a maintenance shop, safety equipment and others are all recommended and discussed.

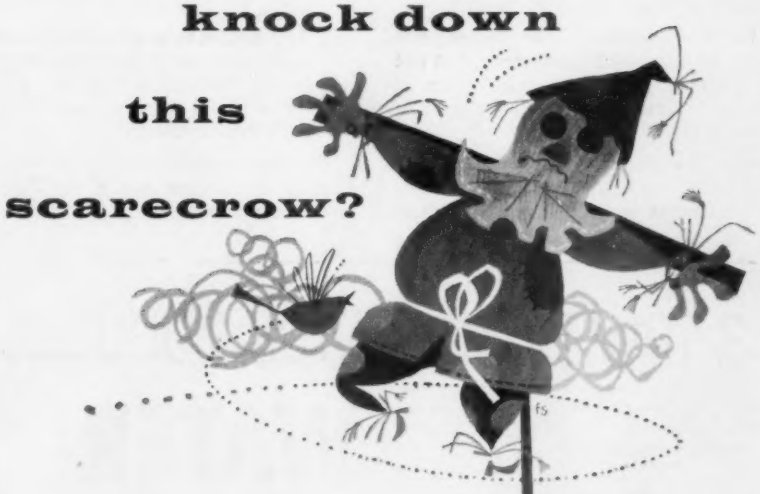
"Proper Tools for Distribution System Maintenance." By Howard W. Niemeyer, Supt. of Distribution, Indianapolis Water Co. *Jour., AWW Ass'n,* December.

History of Membrane Filtration

In a report to the London (England) Metropolitan Water Board on water supplies for that city, Dr. E. Windle Taylor, director of water examination, discusses the use of membrane filtration. He prefaces it with a brief history of the use of this method, which is as follows: Collodion membranes have been used for almost 100 years in biological investigations and from time to time have enjoyed periods of popularity for various processes. The manufacturing techniques for providing membranes of consistent pore size have steadily improved in efficiency. A plant for the manufacture of the collodion membranes was set up at Gottingen following Zsigmondy's pioneer work when he was director of the Institute of Colloid Chemistry in the University of Gottingen. We learn that they were first used for estimating the coliform content of water in Russia in 1933-1934, and since 1943 membranes have been used to test water samples in Germany. After the Joint Intelligence Objective Agency of the Armed Services had an opportunity to study the German plant, membranes and filtration equipment have been developed in America under the leadership of Dr. Alexander Goetz (Goetz and Tsuneishi, 1951).

During the years 1952 to 1954 considerable experimental work has

mind if we knock down this scarecrow?



Stuffed with straw though he is, he sometimes looms like a bogeyman in discussions of municipal water supply. For he represents the idea that diatomite filtration of water supply requires an unusual degree of skill and training on the part of the operator.

Now this is simply not so! The experience of the communities now employing diatomite filtration for their potable water supply is ample evidence that you don't require a highly trained technician to operate a diatomite system. Rather, it tends to show that anyone having intelligence for a responsible municipal job can easily and quickly learn to operate a diatomite filtration system with completely satisfactory results. Granted, where pre-flocculation or other pretreatment of the raw water is used, it helps to have an operator with some technical training, nor do we mean that a diatomite system can be operated by any ten-thumbed fumbler.

Simply and plainly, we say merely this: the operator of a well-designed diatomite filtration system requires no higher degree of skill and technical knowledge than is demanded for the operation of a conventional rapid sand filtration system, which depends so largely on flocculation and chemical treatment. And the experience of the communities now filtering their municipal water supply with Dicalite Filtraids backs us up!

Send for our Bulletin F-552 for more complete information.

Dependable GLC GREAT LAKES Dicalite DIATOMACEOUS MATERIALS

dicalite division, *great lakes carbon corporation*
612 south flower st., los angeles, california

been carried out in the Board's Laboratories where both the German and the American apparatus were available for tests.

A system of analysis has been worked out which has incorporated the following practical points:

(a) The adoption of the German apparatus and membranes, but not their method of cultivation of the membranes on semi-solid agar.

(b) The adoption of the American method of incubating the membranes on pads of sterilized filter paper impregnated with the culture medium.

(c) The adoption, when necessary, of the resuscitation technique advocated by Allen and his coworkers (Childs and Allen, 1953).

(d) The adaptation of bacteriological media, such as MacConkey broth, commonly used in this country, for use in connection with this technique.

Following a very complete description of the method and of the English procedure, he states that the method is particularly useful for examining a series of samples, and especially where the content of B. Coli only is required; and expresses the hope that it will become the routine method for bacteriological examination of river and storage reservoir water samples.

"Pollution Dangers to London Water Supplies." *The Surveyor*, January 5.

Building a Bottle-Tight Reservoir

Omaha, Neb., completed in 1954 an underground reservoir under a golf course which has proved to be unusually water tight. A 72-hour test made after completion showed a loss of water of 5 gpm. Available data on leakage from similar structures showed that a reasonable leakage, which was used as a limit of the amount required by this contract, would be about 2¼ times this amount; and the contractor was paid a bonus of $8,380.50. Two weeks later the leakage had decreased to about half this amount, and has continued to decrease since then.

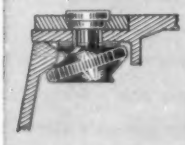
The reservoir is 400 by 200 ft. inside dimensions, with a water depth of 35 ft. The height of the vertical enclosing wall was reduced to 15 ft. by sloping the sides of the roof and the floor for 21 ft. from the wall. The rest of the roof is a flat slab supported by columns spaced 20 ft. apart. Except for the slopes along the outer walls, the bottom is a flat slab. The subgrade for a thickness of 3½ ft. was compacted and sealed with a 6-in. slab of concrete. The footings rest on this; also 8 in. of sand-gravel provided with drains under the 6-in. reinforced concrete floor slab. These drains and others located at the outside base of the vertical walls discharge to a drainage vault, whence float-operated pumps discharge the leakage to a sewer. The largest floor slabs are 40 ft. square, with square butt joints with pan-type water stops of 16 oz. copper bedded in a heavy coating of pitch and riveted and soldered together. One of the joints along the wall opened somewhat during later construction, believed to be due to some sand flowing out from under the slab. This was remedied by grinding the floor surface flush along both sides of the joint and sawing a slot along the joint ¼ in. wide and 1½ in. deep. This slab was filled with liquid rubber and sprayed with elastic vinyl. All sloping joints and vertical wall joints were given supplementary waterproofing by scrubbing the concrete surface for about 9 in. on each side of the joint with

a few plain words about...

WATER METERS!

METER YOKES

The Ford Yoke dates back to 1911. Its outstanding success resulted in a wide variety of meter holding devices called yokes. But the Ford yoke as now made offers advantages not obtainable in any other type of meter setting. Millions are in use.

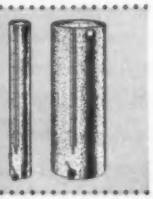


LIFTER WORM LOCK

The original Ford Worm Lock was introduced almost forty years ago. Because of its simplicity, safety and powerful screw-jack action it is now widely used. The Lifter feature, a recent improvement, provides automatic attachment of the key on unlocking.

CALIBRATED TESTING TANKS

Before Ford Calibrated Testing Tanks were put on the market about 35 years ago, such meters as were tested were checked against gravimetric scales, which were complicated and inconvenient. Thousands of Ford Tanks are in service, in sizes from one to 1000 gallons.



METER VALVE

The Meter Valve is a close-coupled combination of an inverted key valve and a meter connection. It saves material, pipe joints and space in the meter setting. Ford Meter Valves bear the trademark name of Ringstyle Valves.

THE KORNERHORN

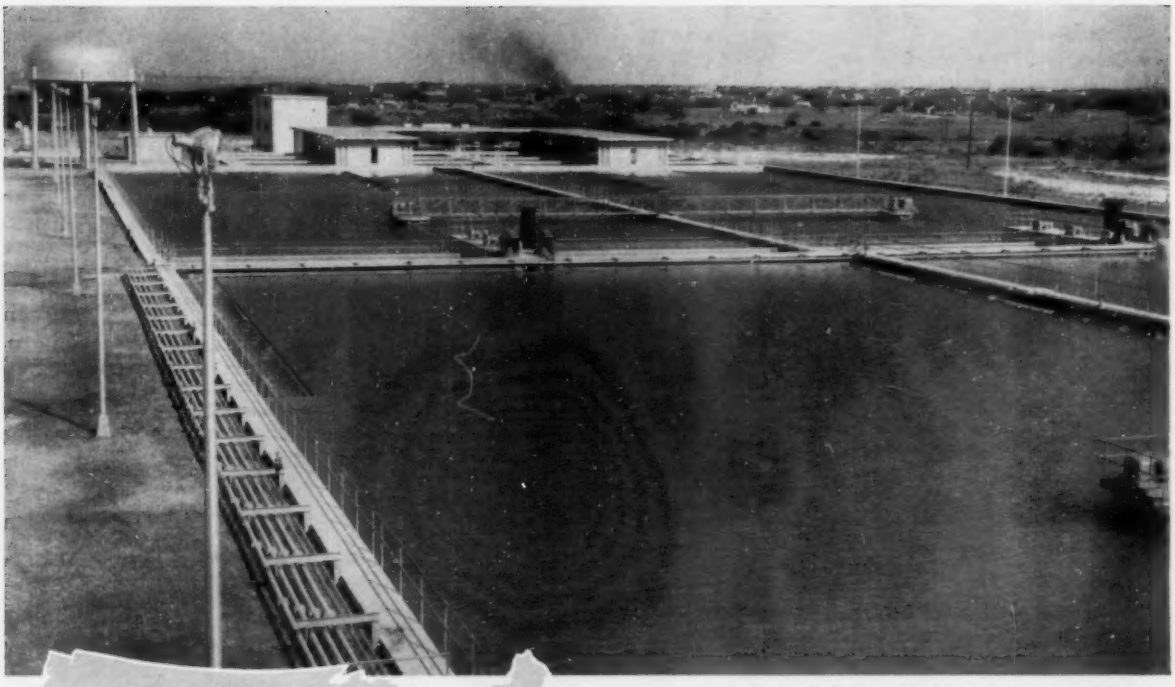
In a vertical basement pipe, against the wall or in a corner, the Kornerhorn makes a most satisfactory meter setting. Installation is fast and economical as pipe threading is eliminated. Send for detailed information.

Meters can *earn* real money. In most water utilities they measure and determine *all* the income.

It is good business to accord meters the treatment they deserve as valuable equipment and as sources of revenue. Such enlightened treatment includes settings which provide protection, easy availability for reading, and trouble-free meter changes for proper maintenance.

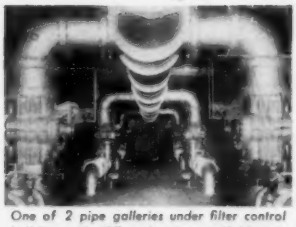
For 60 years our company has served thousands of water utilities in providing better water meter settings. Submit *your* problems to Ford.

THE FORD METER BOX COMPANY, INC.
FOR BETTER WATER SERVICES
WABASH, INDIANA
FORD



New O. N. Stevens Filtration Plant at Corpus Christi, Texas

New "Push Button" Filtration Plant Uses American Cast Iron Pipe



One of 2 pipe galleries under filter control building, with 42" wash water manifold overhead. American Cast Iron Pipe and Fittings.

Filter Plant Effluent. Six high service pumps connect to 48" discharge manifold. American Cast Iron Pipe and Fittings.

Many of the operations at Corpus Christi's new water filtration plant are controlled from a central panel in its modern, functional filter building. Much of the "push-button" control equipment is new to the water works field.

When it came to pipe, designers of this new plant chose a long-time favorite of water works men — American Cast Iron Pipe. Time-proved, durable American Cast Iron Pipe adds not only the assurance of long, trouble-free service life, but also the economy and efficiency required by modern plant design and operation.

Call your American Cast Iron Pipe Company representative when your new plant or system is in the planning stage. Experienced, capable and cooperative, he can help you effect maximum economies in initial and maintenance costs.

AMERICAN CAST IRON PIPE CO.
BIRMINGHAM 2, ALABAMA

SALES OFFICES
Kansas City • Minneapolis
Dallas • Denver • Orlando
Pittsburgh • Cleveland
New York • Chicago
Los Angeles • San Francisco

a solvent followed by a liberal brush coat of penetrating vinyl primer, and a final application of elastic vinyl.

"Omaha Builds Bottle-Tight Reservoir Under Golf Course." By Richard O. Davis. *Water Works Engineering*, January.

Other Articles

"Reducing Unaccounted-for Water by Continuous **Leak Survey**" at Indianapolis, Ind. By Howard W. Niemeyer, Supt. of Distribution. Jour., AWW Ass'n, December.

"**New Chemicals** Used in Treatment at Gary", Indiana. Liquid alum, pickling liquor, bentonite clay, liquid ammonia, and quaternary ammonium compound. By Leo Louis, Gen. Mgr., Gary Hobart Water Corp. Jour., AWW Ass'n, December.

"**Abandoned Well Field** Reconditioned to Augment Four-Cornered System." Hamilton, Ohio purchased a "war surplus" well field and reconditioned 4 of the 11 wells. By Harold W. Augenstein, Supt. and Howard J. Kirn, Consult. Eng. Water Works Engineering, January.

"**Standards** of Water Quality—What Is Their Practical Value? Operators' Manual on Laboratory Control." By F. W. Gilcreas, Prof. of San. Sci., Univ. of Florida. Water Works Engineering, January.

"What Are the **Safe Yields** of Pennsylvania's Water Sources?" Describes method of estimating them. By J. D. Carpenter. Water Works Engineering, January.

"**Long-Range Planning** for Water Service." By Abel Wolman, Prof. of San. Eng., Johns Hopkins Univ. Jour., AWW Ass'n, December.

"Meeting **Industrial Water** Requirements". By John R. Bettis, Eng. of Public Works, Charleston, S. C. Jour., AWW Ass'n, December.

"**Indexes** of Water Works Construction Costs." Discussion of the Handy-Whitman Index of Water Works Property Construction Costs. By Ernest C. North. Jour., AWW Ass'n, December.

"Recommended **Chlorine Residuals** for Military Water Supplies." Minimum residuals and minimum contact time. By W. Brewster Snow, of Rutgers Univ. Jour., AWW Ass'n, December.

"Charges for **Extending Water Lines** to Subdivisions and Developments." Data from 1600 municipalities summarized. Public Works, February.

"**Radioactivity** and the Water Industry." A general discussion. By Arthur W. Kenny, Radio Chemical Inspector, Ministry of Housing, England. Contractors Record, Dec. 12.

• • •

Radio Traffic Reporter

What is said to be the first radio-controlled traffic recorder in the United States is in operation at a location on U. S. 30, west of Cheyenne, Wyo. The device was developed by the Chief Radio Engineer of the Wyoming Highway Department in cooperation with the Traffic and Planning Division.

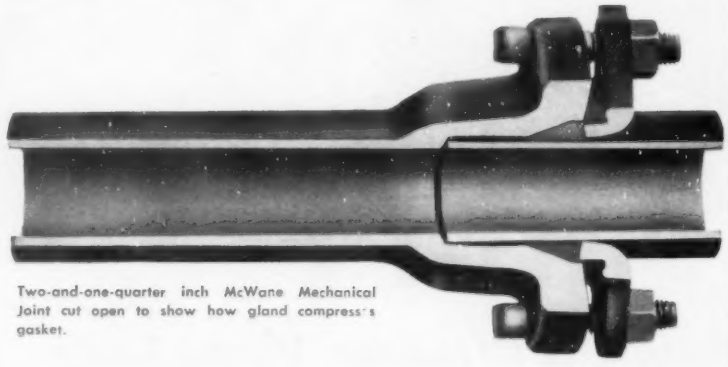
A coil, buried beneath the highway surface, is influenced by the earth's magnetic field. Any vehicle passing over the coil disturbs the magnetic field and this disturbance is detected by the electro-matic amplifier in the reporting unit. At the instant a vehicle passes the reporting device, a click is heard in the receiver. At the end of each hour, the recorder prints a figure showing the total number of vehicles passing the counter during the hour.

• • •

Federal Practice in Relocation of Utility Facilities

The current practice of the Bureau of Public Roads in the payment of utility relocation costs by using Federal-aid highway funds is as follows:

The maximum amount of Federal participation proposed was a provision in the Senate passed Gore Bill (S 1048) making it mandatory



Two-and-one-quarter inch McWane Mechanical Joint cut open to show how gland compresses gasket.

McWANE Super DeLavaud

CAST IRON PIPE

2" & 2¼" TO 12" SIZES

Cast centrifugally, 4-inch to 12-inch sizes in laying lengths of 18-feet, 2-inches; 2-inch and 2½-inch sizes in laying lengths of 20-feet.

Joints furnished include Mechanical, Bell-and-Plain-End, Flanged or Plain-End.

Super DeLavaud centrifugal castings insures even wall thickness, sound metal section, uniform diameter, high strength metal, easy to cut or tap. Furnished uncoated, tar coated, Enameline or cement coated.

Quick Shipment!

McWANE CAST IRON PIPE COMPANY
GENERAL OFFICES & FOUNDRIES, BIRMINGHAM, ALA.
Sales Offices: Dallas Chicago Kansas City New York Birmingham

GUIDED MISSILE Dead Center!

Because an ample supply of water is vital to the government guided missile base at Cocoa, Florida, authorities installed 160,000 feet of 36″ and 64,000 feet of 24″ LOCK JOINT PRESTRESSED CONCRETE CYLINDER PIPE. Every joint of each 16′ section in this line fits dead center because the volumetrically measured rubber gasket exactly fills the annular recess in Lock Joint's self centering flexible Rubber and Steel Joint.

How many pounds of rubber were required to seal this line? The answer can be computed from the figures in the illustration above.

This is an interesting statistic, but more important is the fact that besides the volumetric measurement, careful tests for strength and elasticity are made on *each rubber gasket before it is used*. These are only a few of the many quality control tests which mark every phase of the manufacture of Lock Joint Concrete Pressure Pipe.

LOCK JOINT PIPE CO.
East Orange, New Jersey

Sales Offices: Chicago, Ill. • Columbia, S. C. • Denver, Col. • Detroit, Mich. • Hartford, Conn. • Kansas City, Mo.

Pressure • Water • Sewer • REINFORCED CONCRETE PIPE • Culvert • Subaqueous

for the Federal Government to pay 50 percent of the utility relocation costs in states where the utility is required to bear all this expense. The provision limited reimbursement to two percent of the funds apportioned to a state for any fiscal year.

Section 111 of the Federal-Aid Highway Act of 1956 provides that whenever a state shall pay for the cost of relocation of utility facilities in accordance with state laws and regulations, Federal funds may be used to reimburse the state for such cost in the same proportion as Federal funds are expended on the project. A proviso prohibits the payment of such funds to states when the payment to the utility violates the law of the state or violates a legal contract between the utility and the state.

The term "utility" is defined to include publicly, privately, and cooperatively owned utilities.

The term "cost of relocation" is defined to include the entire amount paid by the utility that is properly attributable to such relocation less any increase in value of the new facility and any salvage value derived from the old facility.

In the case of projects on the Interstate System, a state that pays the entire utility relocation costs may be reimbursed at the rate of 90 percent of the cost and at the rate of 50 percent for other Federal-aid projects. In public land states (where the Federal matching is increased up to a maximum of 95 percent because of the large area of public lands), reimbursement would be in the same proportion.

The practice of the Bureau of Public Roads since the Federal-Aid Highway Act of 1944 has been to permit the use of Federal funds to reimburse the states for the pro rata share of the cost of relocation of utilities when such costs have been paid by a state. In actuality, the new provision in the 1956 Highway Act does not represent a departure but merely sanctions the propriety of using Federal funds where a state under its own laws or practices pays such costs on Federal-aid highway projects.

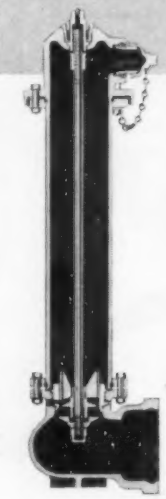
There is no requirement in Section 111, either expressed or implied, that a state must pay all or any part of utility relocation costs. In fact, as before stated, the section contains a proviso prohibiting the use of Federal funds to reimburse a state when the utility relocation payment was made in violation of the state law or a legal contract between the state and the utility.

Air Sampling for Smog Control

THE AIR SAMPLING program of the Los Angeles Air Pollution Control District uses automatic and manual sampling of the atmosphere at 15 strategically located stations. The objectives of the program are: 1. To guard the public health against any concentration of crisis potentiality, 2. To provide a basis for a zoning program for selective location of industry, 3. To obtain further information on the nature of the reactions which occur in the atmosphere, 4. To evaluate control measures.

Air pollution monitoring is a new field, and most of the instruments used have been developed especially to meet the problems of the District. One of the requirements for automatic instrumentation is that the instrument be specific for the materials for which it is designed. Whenever interfering substances are present, correction should be easily possible.

R. D. Wood, Leader Since

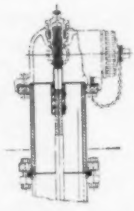


A Low-Cost Hydrant You Can Depend On

The R. D. Wood Standard Swivel Joint Hydrant gives you the most for your money in strength, reliability and sound design. The *all-bronze stuffing box*, gland and operating nut prevent rust and corrosion. Internal friction which might lower pressure is reduced to well below A.W.W.A. specifications by tapered nozzleways and carefully rounded changes in diameter.

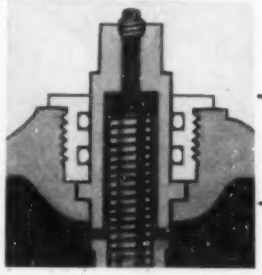
Breakable Flange and Stem Coupling

Available at slight extra cost. Designed to snap under a blow which would otherwise smash the hydrant, flange and stem coupling can be inexpensively and quickly replaced without excavation.



Extension Piece

Can be inserted without interrupting water flow.



Hydrants now available with O-Ring Seal when specified

Among instruments in common use and their functions are: *Carbon monoxide recorder*—Records automatically on a continuous chart variations in the absorption of light shining through a tube of contaminated air, thus determining the concentration of carbon monoxide.

Sulfur dioxide autometer—Measures the amount of sulfur dioxide in the atmosphere through variations in an electric current produced by absorption of sulfur dioxide in a hydrogen peroxide-sulfuric action solution.

Nitrogen dioxide and nitric oxide recorder—Records both pollutants through evaluation of color changes produced by introducing the gases into a reagent solution.

KM sampler—Measures dark-colored particulate matter in the atmosphere by drawing a measured volume of air through a white filter paper.

Total oxidant recorder—Indicates the net oxidizing effect of smog after deduction has been made for reducing agents or effectants.

Ether-soluble aerosol sampler—Measures all types of liquid or soluble in ether by drawing air through a filter paper, extracting deposits by submersing the paper in ether, and weighing the material after the ether has evaporated.

Hydrocarbon sampler — Determines amount of hydrocarbons in the atmosphere by condensing hydrocarbons at low temperature in a liquid oxygen trap, and then analyzing the collected mass with an infrared spectrophotometer.

Aldehyde and ketone sampler—Measures aldehydes and ketones by the intensity of reaction with a liquid reagent.

Ozone recorder—Measures manually the concentration of ozone in the atmosphere by determining the time necessary for a bent strip of rubber to crack, which takes place at a rate proportionate to the amount of ozone present.

Dust fall recorder—Measures dust by weighing the materials trapped in water-filled jars.

The sampling stations are being equipped with sulfur dioxide, nitrogen dioxide and carbon monoxide recorders. When developed, ozone recorders will also be installed. In addition to the permanent stations, the District also plans to take air samples with a mobile laboratory in areas where there is no station, or where conditions warrant a special air survey. Ultimately, all stations will be connected with District headquarters through a direct wire which will transmit readings instantaneously for interpretation at the central point. Supplementing the system are 65 weather observation stations.

Specimens of smog-sensitive vegetation are also kept at, or near, the stations and observed daily for symptoms which are accurate gauges of the crop-damaging effects of smog. There are 17 plant observation stations, where two types of plants are observed: poa annua, a bluegrass, which indicates intensity of smog, and petunias, which indicate the type of pollutant causing the damage.—From Smog Brief, No. 10, Los Angeles Air Pollution Control District.

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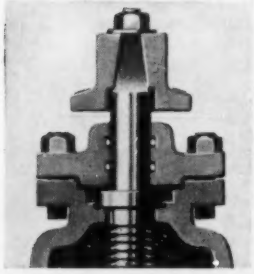
System of Highways in Maryland

Maryland has approximately 20,000 miles of roads which can be classified as follows: State roads—4,625 miles; county roads—13,036 miles; municipal roads—2,500 miles. Almost all of the county roads are classified as secondary, while a little less than 40 percent of the State roads are classified as primary. A recent report outlines the plans for the new Interstate Highway system in that state.

1803, Presents

A Gate Valve Built for Generations of Trouble-Free Operation

The R. D. Wood Gate Valve can be depended on to work and keep on working for years. It is simply constructed—a spreader and two discs are the only moving parts. The discs are free to revolve their full circumference, preventing uneven wear on faces and seats. When fully open, gates are entirely clear of flow.



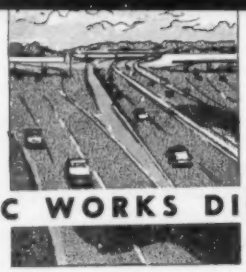
R. D. Wood Gate Valves now available with O-Ring Seal when specified

all available with mechanical joint and flange-type pipe connections

R. D. WOOD CO.

Public Ledger Building, Independence Square · Philadelphia 5, Pa.

Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe (centrifugally cast in sand molds)



PUBLIC WORKS DIGESTS

THE HIGHWAY AND AIRPORT DIGEST

Maintaining Bare Pavements in Winter

Niagara Falls, N. Y. keeps its 175 miles of streets bare of snow and ice all winter as an economic necessity. To accomplish this it uses salt exclusively, after several years of use of cinders with or without salt. Salting is begun as soon as a storm starts, and to accomplish this, the salt-distributing trucks are kept filled with salt ready for instant use as soon as ice starts to form or snow to fall. Generally salt is spread at the rate of 300 to 400 pounds per mile of two-lane streets; or 100 pounds more if a heavy storm is anticipated. Usually this is all that is needed, but plows are put into service if the depth of snow approaches 4 inches. It takes about 8 hours to salt all the streets using 10 distributors—less time than when using cinders with or without salt. Rock salt is stock-piled early in the season. There has been no trouble with caking of the salt, but it is proposed for the future to get the salt early in the summer and use International Salt's anti-caking agent "Storite."

"Industry Requires Bare Pavements All Winter." By Dave Mann, Director of Public Works. PUBLIC WORKS, February.

Designing Traffic Interchanges

Traffic interchanges will be vital necessities in the new interstate system. The success of a freeway depends upon the care taken in the design and location of its traffic interchanges. There are 450 traffic interchanges in California's highway system, and J. C. Young, Engineer of Design of California Division of Highways, and A. L. Elliott, bridge engineer of the division, were asked to give their views on the subject, the former on geometric layout, the latter on structural design.

Mr. Young said an interchange should turn an intersecting traffic movement into a merging movement, and in such a way that the major traffic movements have the shortest travel path. Extreme care must be taken in laying out acceleration and deceleration lanes. The spacing between interchanges must be determined by traffic needs, but there should be at least 1,000 ft. between two off-ramps, and at least 600 ft. between forks on the collector road system. There are four general types of interchanges—the clover leaf, the diamond, the directional type, and the rotary interchange. The clover leaf is avoided where possible, and a collector road parallels the freeway, thus reducing points of traffic friction with the freeway from four to two. The di-

City and Railroad Quiet a Noisy Overpass

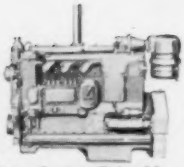
FOR YEARS a timber trestle over the Baltimore & Ohio Railroad in Plymouth, Ohio, had taken a severe beating from heavy traffic. Constructed of treated timber, the trestle is 64 feet long and has a roadway 34 feet wide with a sidewalk on each side. The 8 x 16 stringers on 21-inch centers were in sound condition, as were the timber bents and abutments. It was the flooring that was in bad condition. Not only was it rough and noisy, but it presented a hazard and source of damage to automobile tires and equipment.

The structure had been built and is maintained by the railroad. In the renovation project, it was decided to replace the old worn-out wood plank flooring with Armco steel bridge plank. The bridge was closed and traffic detoured while the replacement was underway. Under the supervision of H. L. Stephens, foreman for the B&O, the old planks were stripped off. Corrugated bridge planks, each 24 inches wide, were supplied in 16- and 18-foot lengths. Before placing, the two lengths were welded together to span the full width of the roadway. The sidewalks were not included in the project because they were in satisfactory condition.

Individual steel planks were attached to the wooden stringers by means of 6-inch lag screws, after first drilling 25 holes in each plank. The corrugated planks were lapped and then permanently connected to each other by welding. Paving of the floor consisted of filling the 2-inch deep corrugations with a hot asphaltic mix and covering them to a depth of about 1 inch. This work was done by the railroad; the village paved the approaches. The job, completed in three days, resulted in a smooth roadway over which traffic rolls without the familiar old "clickety clack" sound, or worse.

MODERN HEAVY-DUTY CAT† DIESELS FOR EVERY JOB

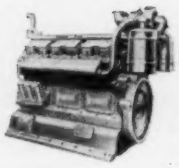
NEW D318
(Series G)
Turbocharged
175 HP†



Smaller, Lighter, Lower Priced!

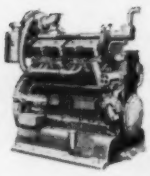
Keeping in line with Caterpillar's continued diesel leadership are these new Series G engines. They are designed for use in installations where space is at a premium. Both are small, light and low-priced; yet they deliver dependable power with the renowned Caterpillar durability. Both are available naturally aspirated (shown here) or turbocharged. Choice of air or electric starting system.

D397
with Turbocharger
650 HP†



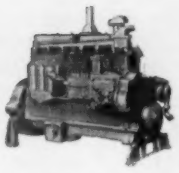
Also a Roots blown, naturally aspirated or spark-ignition engine; electric set or torque converter power unit. Air, electric or gasoline starting.

D375
with Turbocharger
430 HP†



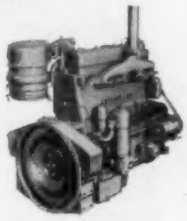
Also a Roots blown, naturally aspirated or spark-ignition engine; electric set or torque converter power unit. Air, electric or gasoline starting.

D342
Naturally Aspirated
210 HP†

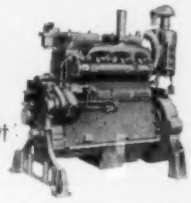


Also available as an electric set. Choice of air, electric or gasoline starting system.

NEW D315
(Series G)
Turbocharged
115 HP†

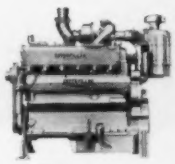


D339
Naturally Aspirated
140 HP†



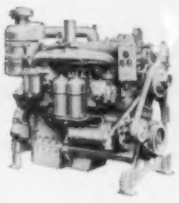
Choice of air, electric or gasoline starting system.

D337
with Turbocharger
310 HP†

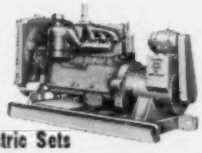


Also available as an electric set or torque converter power unit. Choice of air, electric or gasoline starting system.

D326
Naturally Aspirated
200 HP†



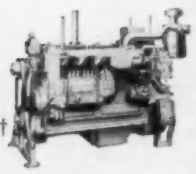
Also available as an electric set or torque converter power unit. Choice of air, electric or gasoline starting system.



Electric Sets

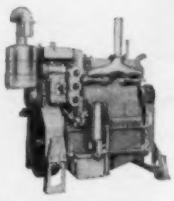
Dependable electric power, featuring the new Cat Generator, available in standard voltages, 60-cycle, in the following KW sizes: 30, 40, 60, 100, 150, 165, 200, 225, 250, 315, 350. Also available as 50-cycle and DC units.

D318
Naturally Aspirated
137 HP†



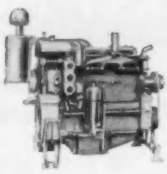
Also available as an electric set or torque converter power unit. Choice of air, electric or gasoline starting system.

D315
Naturally Aspirated
91 HP†

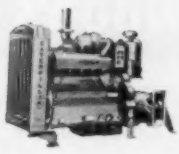


Also available as an electric set or torque converter power unit. Choice of air, electric or gasoline starting system.

D311
Naturally Aspirated
65 HP†



Also available as an electric set. Choice of air, electric or gasoline starting system.



Torque Converter Power Units

Many different arrangements are available for each of six Cat Engines. Wide choice of power units and wide choice of output shafts.

†*maximum output capacity*

In its quarter century of diesel leadership, Caterpillar research has been responsible for advance after advance in the efficiency of these engines. The units you see here incorporate the latest diesel developments – a modern heavy-duty line that offers you hundreds of various packages to meet your requirements for work power or standby power. Whatever your original or replacement needs, you'll find exactly the unit you want in this line-up, with engines available up to 650 HP (maximum output capacity) and electric sets up to 350 KW (continuous duty). Leading equipment manufacturers can supply them in the machines they build.

For complete information about them, see your Caterpillar Dealer.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

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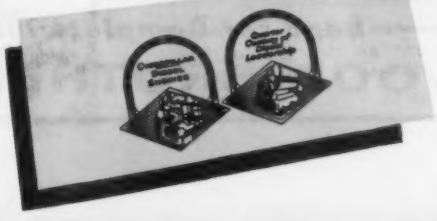

rectional type of interchange is one of the best to use. An interchange may cost from $150,000 to as much as $7,000,000. One thing to avoid is combining a railroad grade separation with an interchange.

Concerning structural design of bridges, Mr. Elliott said that where speed of construction is important, steel is used rather than concrete. Reinforced concrete box girder construction is more economical than concrete T beams, and they give a better appearance. Unnecessary architectural appearance is avoided. Steel beams made of welded plates are much more economical than rolled shapes, and riveted steel structures are no longer used. As to width of bridges, those 150 ft. or less in length are made of full width of road including shoulders; longer ones have the width reduced to that of the traffic lanes to be served plus offsets. Usually a separate structure is provided for each of the two directions of traffic. In building a bridge over a highway, it is supported at midspan by a column located in the dividing strip as cheaper than one long span.

"Latest Expert Thinking on Traffic Interchange Design." *Engineering News-Record*, Jan. 24.

Effect of Equipment on Labor Usage in Highway Construction

Labor usage data collected by the Bureau of Public Roads since 1944 indicate a pronounced decrease in the number of man-hours of direct labor required for a given physical volume of highway construction. This decrease was basically due to increased productivity of the labor-equipment combination resulting from great strides that have been made by manufacturers in developing more efficient construction equipment. The data used are based on labor usage and contract costs reported by contractors for federal-aid highway construction projects. From a value of approximately 217,700 man-hours per million dollars construction costs in 1944, the factor decreased to about 123,000 in 1955, the costs being adjusted to dollar values of 1954. During the period 1944-1955 construction bid prices increased about 35%. Had there been no reduction in labor usage factors, the bid price increase would have been 61%.

"Labor Usage in Highway Construction as Influenced by Improved Equipment." By Edwin J. Coppage, Jr., Chief Construction Management Section, and Edwin L. Stern, Supervising Highway Engineer, of B.P.R. *Public Roads*, February.

Fly Ash In Concrete

Recent interest in the use of fly ash in concrete for highways has created a need for suitable specifications and methods of test for this material when it is used to replace part of the cement. The effect of fly ash on the strength of portland cement-fly ash mortars is considered to indicate the probable effect on the strength of concrete, and is used in this investigation as a criterion for evaluating other tests of fly ash. The effect of fly ash on the expansion resulting from the alkali-aggregate reaction is also considered. To determine the variations in properties which may be expected and the effect of these variations on the behavior of the fly ash in mortar, 34 fly ashes from 19 different sources were examined.

The results of the tests indicate generally that the strength developed in portland cement-fly ash mortars is related to the carbon content of the fly ash, the fineness of fly ash as measured by the

SHRED BRUSH
WITH A
WOOD'S ROTARY MOWER

- Mows grass, shreds brush, mulches leaves
- 12 Models...for every tractor
- Quick detachable, free-swinging blades
- Trouble-free, simple construction
- Costs less to buy and operate
- All working parts enclosed

MODEL 80 (61 similar)

Make short work of land clearing and brush cutting with a Wood's Rotary Mower-Shredder. The Model 80 takes nearly a 7-foot cut . . . goes right through brush thick as a man's wrist. Saves expensive hand labor, ends disposal problems. Cuts close to buildings, trees and fences. Maneuvers easily around roadside ditches and banks. Ideal for large acreage leaf mulching, grass and weed control. More dependable and less expensive than reel-type or sickle bar machines.

Wood's Rotaries are adjustable from ground up to 14" height (most models). V-belt drive and free-swinging blades absorb shock loads, protect both machine and tractor. Blades are quick-detachable and overlap for cleanest cutting. 15" drop-center wheels or 8" with non-pneumatic tires. Models 80, Offset 80, 61 and 114 have brackets for remote control hydraulic cylinder.

12 Models . . . 42" to 114" cut. 42" undermounted for Farmall Cub, Lo-Boy, Super A, 100, A-C G, M-H Pony and Pacer. 42" rear-mounted for Fast Hitch Cub and Lo-Boy. 61" and 80" rear-mounted for Fast Hitch Farmalls Super C, H, M, 200, 300, 400, I-300 (all use 3 pt. adapter), and all standard 3-point hitch tractors (Ford, Ferguson, Oliver Super 55, etc.). 61", 80", and 114" drawbar pull-types for any 2, 2-3, and 3-4 plow tractors. 80" offset model (2-3 plow) for working under trees.

Q

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BITUMULS SOIL COVER holds mulch on new-cut banks

NOW... fast, low-cost erosion control

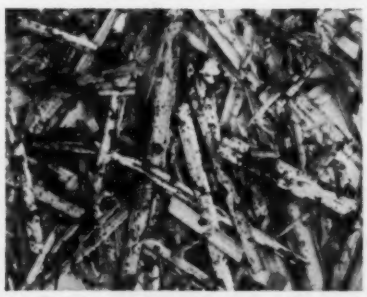
EROSION CONTROL has long been a problem for Roadbuilders where cut-and-fill is required in construction.

Now, thanks to the combination of effective spreading equipment and the holding power of Bitumuls® Soil Cover, this problem has been largely eliminated. Our engineers have developed Bitumuls Soil Cover specifically to combat this type of erosion.

The purpose of the Bitumuls Soil Cover Treatment is to "give nature a chance" after road construction has created . . . on cut or fill . . . an exposed area. Seed retention and growth on such areas is, under any conditions, slow and hazardous. Bitumuls Soil Cover with mulch creates an artificially-held bed for seed-development that resists the action of wind and rain.

Foremost in the equipment field are the machines of the *Finn Equipment Company, of Cincinnati, Ohio,* whose "Mulch Spreader" applies this special Bitumuls adhesive with straw mulch at the rate of one-and-one-half tons of straw per acre of exposed soil. Under average conditions, each ton of straw will require from 100 to 200 gallons of Bitumuls Soil Cover.

For full information on Bitumuls Soil Cover, call our office nearest you.



TESTED, PROVED, *SPECIFIED AND USED* on thousands of acres on the Ohio, Indiana and West Virginia turnpikes, Bitumuls Soil Cover offers these advantages to any Roadbuilders:

1. **Positive adhesion**
2. **Fast, economical coverage**
3. **Easy, uniform placement, even on steepest slopes**

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San Juan 23, P. R.
Tucson, Ariz.
Inglewood, Calif.
Oakland 1, Calif.
Portland 7, Ore.

amount passing the No. 325 sieve, and the water required for mortars contained fly ash as compared with the water required for similar mortars without fly ash. No well-defined relation between the individual inorganic constituents of the fly ash and the development of strength of the mortar was obtained.

These tests also indicate that the effect on the strength of mortar of replacing a portion of the cement with fly ash varies according to the cement used.

Tests of mortar bars show that fly ash may be used to inhibit the expansion resulting from the alkali-aggregate reaction. These tests indicate that the amount of fly ash required to reduce expansion below a safe limit varies for different fly ashes. These tests were made by Physical Research Branch of the Bureau of Public Roads, and were reported by Russell H. Brink, Highway Physical Research Engineer, and Woodrow J. Halstead, Chemist.

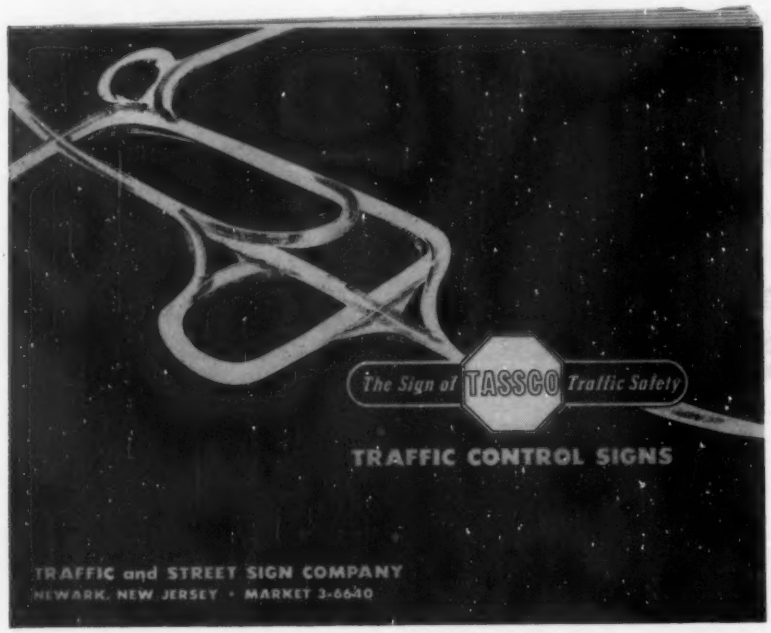
A study of the properties of concrete containing, as replacement for part of the cement, four representative fly ashes which have been used extensively, was made by the B.P.R., and reported by Albert G. Timms and William E. Grieb, Highway Research Engineers. From each source, fly ashes of widely different fineness were selected with the expectation that those with the maximum fineness would have the lowest carbon content. Concrete specimens containing the fly ashes were tested for strength at various ages, for shrinkage at various periods when stored in a dry atmosphere, for durability in freezing and thawing, and for resistance to attack by calcium chloride used for ice removal.

These tests indicate, in general, that at ages through 28 days both flexural and compressive strengths were lower than comparable concrete without fly ash. At one year the strengths of the concrete containing fly ash were about as high or higher than the plain concrete. Fly ash did not improve the resistance to freezing and thawing of non-air-entrained concrete. In air-entrained concrete some of the fly ashes gave satisfactory durability and some did not. The particular portland cement used was also a factor. For the most part, concrete containing fly ash showed less shrinkage upon drying than concrete without fly ash. All substitutions of fly ash for portland cement adversely affected the resistance of both air-entrained and non-air-entrained concrete to attack by calcium chloride solutions.

"Studies Relating to the Testing of Fly Ash for Use in Concrete;" and "Use of Fly Ash in Concrete." *Public Roads*, February.

Operating Rockland County's Highway Department

The Highway Department of Rockland County, N. Y. has so expanded in the past five years that a department building constructed in 1946 was soon outgrown and an addition was built in 1955 and another is planned for 1957. Almost all this construction was done by the department's own men. The department's equipment also has been greatly increased. It now owns station wagons, trucks, graders, shovels, backhoes, cranes, mowers, trailers, pumps, chain saws, pick-up trucks, 4-wheel drive trucks, rollers, bulldozers, sweepers, spreaders, compressors and generators. It also has modern machine shop and garage equipment. It aims to own all the equipment needed to do any highway work except bituminous concrete spreaders and oil distributors. All equipment is replaced when maintenance costs, trade-in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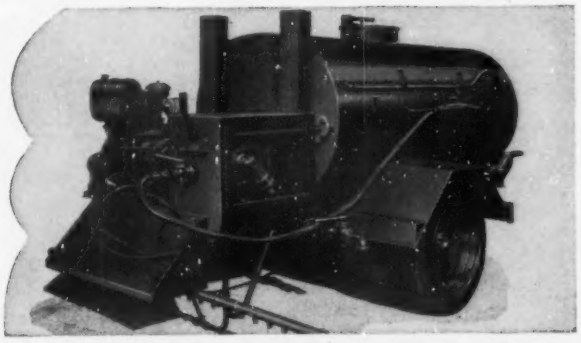
value and efficiency makes it economically adivsable. The all-year employees are supplemented about 50% in the summer by high school and college boys. The most modern office equipment is used.

The great majority of the county roads are old winding wagon roads, not more than 14 or 16 ft. wide, lightly paved for carriage traffic. One of the biggest problems in developing these roads is surface drainage. This is especially acute where the water cannot be led across lots to the nearest stream because of buildings. Brush and weed control is secured largely by chemical spraying by contract. Dead and dangerous trees and limbs are removed by department forces, generally in winter between snow storms. All county roads are marked throughout with traffic lines. In snow control work, the roads are salted as soon as snow begins to fall. A piece of equipment for sanding, salting and plowing is owned for each nine miles of road.

"Operating a County Highway Department." By Nelson W. Hall, Supt. of Highways. PUBLIC WORKS, February.

STANDARD STEEL "S-J"
Maintenance Distributor



DOES THE WORK OF BIG EQUIPMENT ON SECONDARY JOBS FOR LOWER COST

FULL CIRCULATING SPRAY BAR UP TO 10 FOOT LENGTH SEALS COATS AS PERFECTLY AS A FULL FLEDGED HEAVY DUTY PRESSURE DISTRIBUTOR

Standard Steel S-J Maintenance Distributor is available in either trailer or truck mounted type . . . the trailer unit can be quickly converted to truck mounting by removing tongue and running gear. A fuel pump throw out clutch is standard equipment on all models. The clutch disconnects the pump from engine when burners are not being used. The pump and piping provide the following features: (1) Pumps from tank through spray bar (2) Pumps from tank to hand spray (3) Pumps from tank to outside source (4) Pumps from outside source to another outside source (5) Pumps from outside source into tank. This versatility is a very great help in speeding operation of the S-J. Entire pump and piping as well as spray bar can be easily cleaned through its special suck back feature. Write for complete details on the new Model S-J.

OTHER PRODUCTS OF STANDARD STEEL
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A Continuously Reinforced Concrete Pavement

Pennsylvania has completed its first continuously reinforced concrete pavement—two miles of dual-lane highway near York. The pavement is 9 in. thick. Deformed reinforcing mats were used 16 ft. long and 6 ft. 2 in. wide, placed 4½ in. below the surface, overlapped 12 in. at the ends and 8 in. along the sides. The bid price for this construction was $5.47 per lin. ft., compared with $5.75 for standard construction. It is believed that the elimination of joints will cut maintenance costs considerably.

"Pennsylvania Builds Its First Continuously Reinforced Concrete Pavement." *Roads and Streets*, January.

Constructing Fills Across Swamps

Swamps on the right-of-way of the 156-mile Indiana Toll Road necessitated removing over 4,000,000 cu. yd. of peat, muck and marl and backfilling with 5,000,000 cu. yd. of granular borrow. Different methods were used by the contractors. In some cases temporary surcharge was used, to remain until the required consolidation had been obtained and then removed for use elsewhere; in one case 20 ft. of surcharge was required. In other cases a rolling surcharge proved satisfactory. Jetting was used in three locations to help expedite the work and provide additional consolidation of the granular fill. In most locations where the standard method of partial excavation and displacement was used, the rolling surcharge proved satisfactory. Several soils engineers and experts were engaged to advise on methods to be employed. Exploratory borings were made at all bog crossings. Granular backfill was placed over swamps to an elevation 2 ft. above swamp level, and finer-grained material was permitted above this. The author describes in detail the procedures employed at several of the locations.

"Swamp Filling Methods on the Indiana Toll Road." By Hubert C. Persons, Editor. *Roads and Streets*, January.

Other Articles

"A Near-Miracle in **Ice Control**" by use of Banox at Lehighton, Pa. By Walter H. Niehoff, Borough Eng. Public Works, February.

"Master **Traffic Plan** for Miami," Fla. By C. E. Wright. Public Works, February.

"**Soil-Cement Stabilization**" on Oklahoma State highways. By J. J. Stobaugh, Jr. of State Highway Com. Public Works, February.

"A **Mowing** Revolution Has Hit Ohio." Use of chemicals. By Wilbur J. Garmhausen, Landscape Architect, Dept. of Highways. Public Works, February.

"**Adequate Highways** for America." General discussion. By Rex M. Whitton, Pres. AASHO. Civil Engineering, January.

"How to Run a **Highway Department** More Effectively," discussed by highway officials at a conference in July, 1953. Roads and Streets, January.

"How to Avoid **Dangerous Excavation** Cave-ins, Slip-outs and Slides." Pointers given at National Safety Congress. Roads and Streets, January.

"Symposium on **Stabilized Soil Runways**". Summary of three papers by English engineers. The Surveyor, Dec. 15.

"Quick, Cheap **Asphalt Surface Treatment,**" developed by the Connecticut State Highway Dept. Cures almost immediately upon application. Engineering News-Record, Jan. 31.

• • •

Tagging and Removal of Substandard Garbage Containers

A thorough check has been made by inspectors of the City of Phoenix, Arizona, Division of Street Maintenance, of all garbage cans used in the north and northeast areas annexed to the city last summer. Substandard containers used for garbage were condemned and tagged with the violations indicated. The defective containers were subject to removal by the City if the corrections were not made within 15 days. Inspectors examined all tagged cans carefully before permitting their removal, and it was announced at the time of annexation that residents would be allowed sufficient time to bring their garbage cans up to the standard required by ordinance. The purpose of the program was to rid the City of cans which leak or do not have tight fitting lids, or which otherwise are considered obsolete and unsanitary. The ordinance calls for watertight containers of not less than 3 nor more than 20 gallons capacity, constructed of galvanized metal or better, with tight fitting lid of the same material and handles sufficiently strong so that collectors can empty the containers conveniently. In addition, the ordinance requires that no container, including contents, shall weigh more than 75 pounds, and that residential garbage must be drained of all liquids and sacked or wrapped in paper before the parcel is placed in garbage containers.

JACKSON VIBRATORY COMPACTORS

TERRIFIC TIME SAVERS ON ALL THESE APPLICATIONS:

BLACKTOP PAVEMENT PATCHING

The manually guided Jackson Vibratory Compactor delivers up to 4200 2-ton blows per minute, is self-propelling and will compact bituminous mixes in 5" layers close to maximum density at the rate of 1800 sq. ft. per hour. Operated from a power plant mounted on an auto trailer with device for quickly picking up and lowering the compactor, this is positively the most advantageous outfit ever offered for patching blacktop pavement, paving drives, walks and similar applications.

It's equally efficient in compacting granular soils in bridge approaches, water, sewer and gas mains and laterals, sub-bases of pavement widening projects, sub-bases of concrete floors, in trenches (interchangeable bases from 12" to 26" available), and dozens of similar applications. 100% of specified density is readily achieved in 10" layers. The Power Plant is fully capable of operating two of these compactors simultaneously and in many instances labor costs can be cut in two by use of the twin-unit shown at right.

For consolidating base courses of rock, slag, gravel and sand in waterbound and penetration macadam construction the Jackson Multiple Compactor is indeed outstanding. It is used on practically all of the important paving jobs in the nation. By all means write for the complete facts.

TWIN UNIT ▲ DOUBLES PRODUCTION

BACKFILL TAMPING

CAMPACTING IN TRENCHES, ETC.

MACADAM CONSTRUCTION

JACKSON VIBRATORS, INC.
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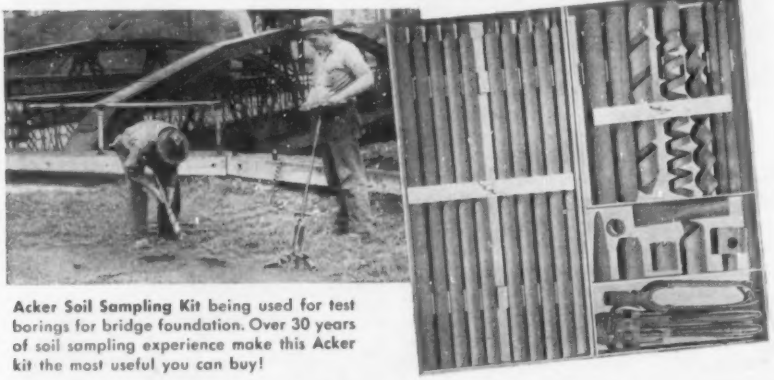
DON'T GUESS!

use an ACKER SOIL SAMPLING KIT for accurate sub-surface information

With accurate sub-soil information, you avoid costly trouble later on. And, what better way to get this information than with a portable, easy to use Acker Soil Sampling Kit. For here is a versatile collection of twelve soil sampling tools packed in a handy steel kit that can be carried in any car.

Write today for prices and Bulletin 26 PW.



Acker Soil Sampling Kit being used for test borings for bridge foundation. Over 30 years of soil sampling experience make this Acker kit the most useful you can buy!

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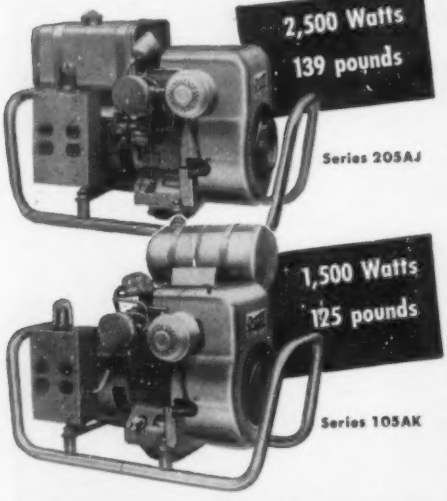
YOU GET *4-cycle* DEPENDABILITY AND *Light weight* TOO . . . IN AN

ONAN Electric Plant



These power-packed electric plants give you all the *4-cycle* advantages of quick starting, long life and trouble-free operation . . . with an amazing weight saving over usual 4-cycle plants. You can carry them easily to any spot . . . and you can count on them delivering their full rated capacity as long as you need it. Both are single-cylinder, air-cooled . . . completely equipped and ready to go.

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Write for special folder on lightweight models!

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Material Requirements For Roadbuilding

Over the next 13 years, the U. S. Bureau of Public Roads predicts that all roadbuilding including Federal-aid, State and local will require 49 million tons of steel; 1399 million barrels of cement; 128 million tons of bituminous material; and 9,170 million tons of aggregate.

At the peak of the program, the Bureau estimates that 442,000 men would be employed directly on highway jobs. Normally, as many more men are required in the supporting industries, such as equipment manufacture and material production.

• • •

Seal Coating Program

The 1956 street seal coating program was completed in August, in Midland, Texas. Applied approximately to 12.3 miles of streets at a total cost of $18,736, the seal coat is to prevent water from getting to the base of the pavement and to preserve the surface of the paving. The life of the pavement can thus be lengthened several years, the actual time depending upon the amount of traffic and the condition of the paving at the time of the seal coat. The cost of the seal coat is approximately 7¢ per square yard as compared to 83¢ per square yard for asphaltic pavement. City forces patched holes and sealed all pavement cracks before the seal layer was applied by the contractor.

As an experiment and to obtain information on the comparative wearing qualities the city used a rubber base additive on about 12,000 square yards of the seal coating job. This data is from the Midland Monthly Report.

• • •

Revenue on the New York Thruway

Toll revenues on the New York State Thruway in September, 1956, were $2,370,512.73, 50 percent over the September, 1955, total of $1,579,307.50. Toll collections from January 1 through September 30 reached $17,084,417.94, up 69 percent from the $10,085,364.80 collected in the comparable period last year. Through September, 1956 mileage travel on the Thruway for the year was an estimated 1,065,591,967, or 55 percent more than in the January-September period of 1955. The average passenger trip in September was 66 miles and the average commercial trip was 83 miles.

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TRUCK MOUNTED
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The new Model 210 Davis Back-hoe, mounted at side for flush digging . . . has 200° continuous operating arc

Rugged Davis Loader, the pacesetter in loader quality, design, and performance

FROM TRANSPORT TO DIGGING IN 1 MINUTE

The Davis Back-hoe with all its popular profit-making performance characteristics – right-angle operation, rotary seat, vertical stabilizers, visibility, and 7,000 pounds of breakaway . . . plus the flush digging features with 200° continuous operating arc on the new Model 210 – is now available as a truck-mounted rig. It can be rushed across town, through traffic, or to jobs far out, and then be ready to dig in only one minute.

COMPLETELY DETACHABLE — FREEING TRUCK FOR NORMAL USAGE IN 5 MINUTES

Although rigidly attached to the truck, it has its own self-supporting legs so that it can be detached – freeing the truck for normal hauling jobs. It has an independent hydraulic system powered by any one of several industrial engines. All models of Davis Back-hoes are basic, and are interchangeable on any truck or tractor equipped with Davis attaching brackets.

Davis Products are sold and serviced everywhere in U. S. A. and Canada by better dealers.

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TOLEDO'S SURFACE TREATING PROGRAM

H M. LOUCKE,
Commissioner, Division of Streets,
Toledo, Ohio

THE SURFACE treating program of various type pavements in the City of Toledo, Ohio, requires 250,000 gallons a year of RS-2, RS-3 and SS-1 bituminous material. To complete our program requires from fourteen to sixteen weeks each year.

To do this work we use the following equipment: Four 2½-ton 5-yd. dump trucks for hauling stone; one 1½-ton truck for setting up barricades, "No Parking" signs and placing flares; two pressure distributors; stone spreaders; two 10-ton rollers and one small tractor to pull a drag broom.

In our treating program we resurface or treat brick, concrete, asphalt and macadam pavements. Our first concern in surface treating is to see that the street to be treated is clean, after which we spray a tack coat of SS-1 which is diluted half and half with water. This is applied to the street surface at the rate of 0.05 gal. per square yard.

For our single course jobs, 0.35 gal. per square yard of RS-2 or RS-3 is applied on the street surface with a pressure distributor; #6 stone is then spread over the material at the rate of 20 lbs. per square yard. The surface is then rolled with 10-ton three-wheel and 10-ton tandem rollers. After the rolling operation is completed, a drag broom is used and the surface is again rolled. To control dust we then apply a fog coat of 0.15 gal. per square yard of diluted SS-1. This is allowed to set 30 to 60 minutes and the surface is then rolled again.

On the course jobs we use a tack coat of 0.05 gal. of diluted SS-1. Then we apply 0.20 gal. per square yard of RS-2 or RS-3. Following this we apply 25 to 30 pounds of #6 stone which is broomed and rolled to remove any high spots. The second coat of RS-2 or RS-3 is applied at the rate of 0.40 gal. per square yard, following which 16 to 18 pounds of #6 stone are applied per square yard. The surface is rolled with the two rollers, after which it is allowed to set for about 30 minutes and is then again rolled. After setting overnight, it is rolled the next day to take care of any loose stone.

The cost for this work in the year 1955 was 19½¢ per square yard.

Our surfacing program actually begins in the late fall when checking of all streets is started to determine which will be surface treated during the next season. If checking is not completed in the fall, the work is carried over to early spring of the following year.

● **BRICK street pavement makes fine base on which to apply surface treatment program. First step is cleaning.**

● **BROOMING is important step in surface treating program. On two-course jobs both courses are broomed, rolled.**

● **APPLYING stone. On single course jobs, 20 lbs. per sy are used; on two courses, 41 to 48 lbs. per sy total.**

● **FINISHED job. Surface treatment program takes 14 to 16 weeks and requires 250,000 gals of bituminous material.**

NEW!

OK CHAMPION
POWER SEWER CLEANER

Model C8-23R6 — *NOW READY!*

40 Years Experience designing and manufacturing sewer cleaning equipment utilized in this new model.

Safety features for operators and sewer line not found on any former model.

Automatic return to neutral position even when power control is left unattended – belt slippage for overload.

Folding arch double pinned to allow lowering to either side or removal.

Extra heavy H beam and double steel channel construction. Overall length only 74 inches. Interchange overnight cable drum from one machine to the other of the pair.

Simplicity of operation.

Two speeds – change from high to low in seconds – eliminates buying transmission.

Rack and pinion jack legs on front and rear end for quick and easy machine leveling and towing.

Operator removed from traffic and moving mechanisms hazards.

Novel belt and gear power transfer from engine to cable drum.

Giant in pulling power.

Pole suspended guide wheel mounting allows virtually 360° positioning choice and transporting without removal from machine.

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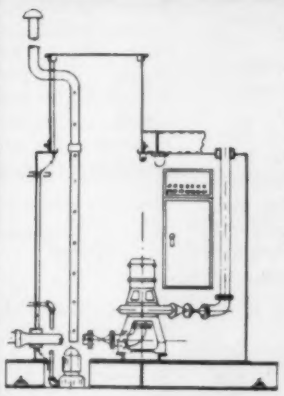

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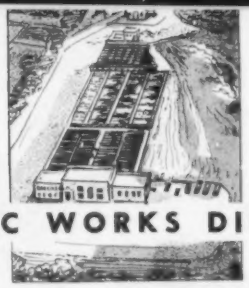


PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Determining Detention Time in Primary Clarifiers

In connection with a study being conducted at the Ames, Iowa, State College sewage treatment plant, the methods of determining detention times in primary clarifiers were investigated. The two most common methods use salt and fluorescein dye as tracers. A new method uses a radioisotope as a tracer. A comparison of all three methods was made under identical conditions in three full-scale operating clarifiers. The results showed that all the mean detention times determined with rock salt were greater than the theoretical time. Those determined with fluorescein dye were less than the theoretical time; the efficiency ratios were reasonably consistent. The mean detention times determined with rubidium radiotracer were less than theoretical, but varied more than was anticipated. This may have been due to the dosing procedure in which the radiotracers were mixed with water and poured directly into the flow at the clarifier inlet ports, possibly providing insufficient mixing with the sewage. There is some indication that the mean detention time is lengthened by increasing the amount of rock salt used as a tracer; but no indication that this is true with fluorescein dye.

"Three Tracer Methods for Determining Detention Times in Primary Clarifiers." By Homer Ambrose, Jr., E. Robert Baumann and Eric B. Fowler, of Eng. Experiment Sta., Iowa State College. *Sewage and Industrial Wastes*, January.

A Modified Recirculation System

Halifax, England, since 1946 has been developing a system of modified recirculation in which the diluting liquid is effluent from aeration tanks instead of filtration effluent. By December, 1954, the method had been put into regular service in one filter, and by June, 1955, a definite operating procedure had been adopted. The original object aimed at was increasing the capacity of the existing filters to make it unnecessary to build additional ones. The weak night sewage is not diluted; the daytime sewage is diluted to 3.20 times its volume, the average 24-hr. dilution factor being 1.92. The bed thus treats not only its former capacity of clarified sewage, but also about the same amount of aeration effluent; producing a filter effluent superior to that obtained at the same time by filters operated without dilution by the aeration effluent.

"A Modification of the Recirculation System." By C. Lumb, Manager of the plant. *The Surveyor*, Dec. 15.

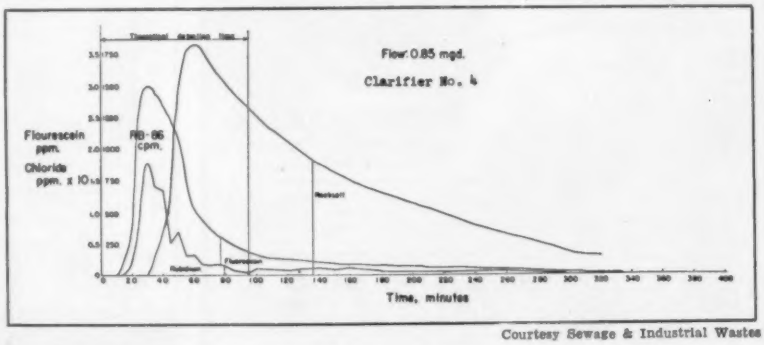
Efficient Use of the Activated Sludge Process

The Commissioners of Ridgewood, N. J., in 1948, realizing that the existing trickling filter plant, built in 1924, was reaching its full capacity, authorized study of the problem, including the construction of a pilot plant at the purification works. This plant provided treatment in three steps, following primary sedimentation. These steps were aeration coagulation, secondary clarification, and sludge reactivation. This study led to modifications of the conventional plant and procedure for oxidative biological purification, which yielded better than 90% BOD removal. The modified plant is less expensive than a conventional one; it eliminates or reduces troubles experienced with load variations. Built-in flexibility and control enable the operator to maintain optimum process values under a wide range of loading conditions, and at the same time exclude foaming, sludge index, aod related problems.

"Studies Promote Better Understanding of the Activated Sludge Process." By John W. Hood and Guenter W. Spohr, Supt. and Chemist. PUBLIC WORKS, January.

New Outfall Sewer for Los Angeles

Construction has begun on 8 miles of 114-inch outfall sewer at Los Angeles, Calif. to relieve the two existing outfalls and provide for the future increase in sewage resulting from the rapidly increasing population. Great care was taken in selecting the route for this sewer. The shortest route would necessitate tunneling through a high hill and this route was examined to locate any areas of possible subsidence or faulting. This included examining 28 test holes to determine soil and ground water conditions. This revealed the presence of seriously objectionable conditions, and other longer routes were examined and one was selected which was about 3,000 ft. longer than the direct line. It included 5.4 miles of tunnel. Test holes and 500 samples of undisturbed soil gave information concerning



Courtesy Sewage & Industrial Wastes

● **CURVES show detention times in primary sedimentation tanks as determined at Iowa State College sewage treatment plant by salt, fluorescin and radioisotopes.**

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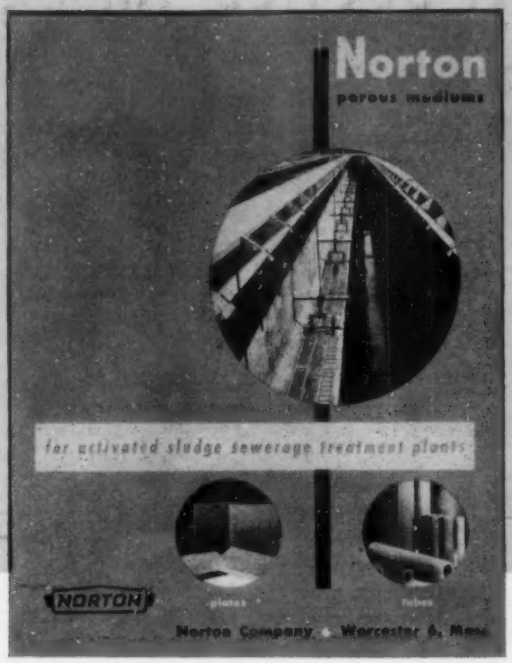
VALUABLE GUIDES TO LOWER COSTS

Learn how Norton porous mediums save time and money in public works operations.



BOOKLET NO. 1246

For Activated Sludge Sewerage Treatment. Norton ALUNDUM* porous plates and seamless tubes have those qualities so necessary for lowest-cost operation — uniform permeability, heat resistance, chemical stability and strength. These and other advantages are described in booklet No. 1246 together with much needed information on proper choice, installation and cleaning of the mediums that will benefit you.

BOOKLET NO. 140

For Municipal Water Filtration. Public works engineers all over the country know that among the most important aids to efficient low-cost filtration are Norton ALUNDUM* porous plates and tubes. This applies equally to the filtering of drinking water as well as water for swimming pools. For more complete helpful information you should have booklet No. 140 offered here.

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by forwarding one or both of the two illustrated booklets described here. And you're cordially invited to take advantage of the Norton advisory and research departments — with assurance that thorough analysis will be given to your porous medium requirements. Remember: Norton refractory products are expertly *engineered and prescribed* to help you solve problems and cut costs. Address NORTON COMPANY, Refractories Division, 222 New Bond Street, Worcester 6, Mass.

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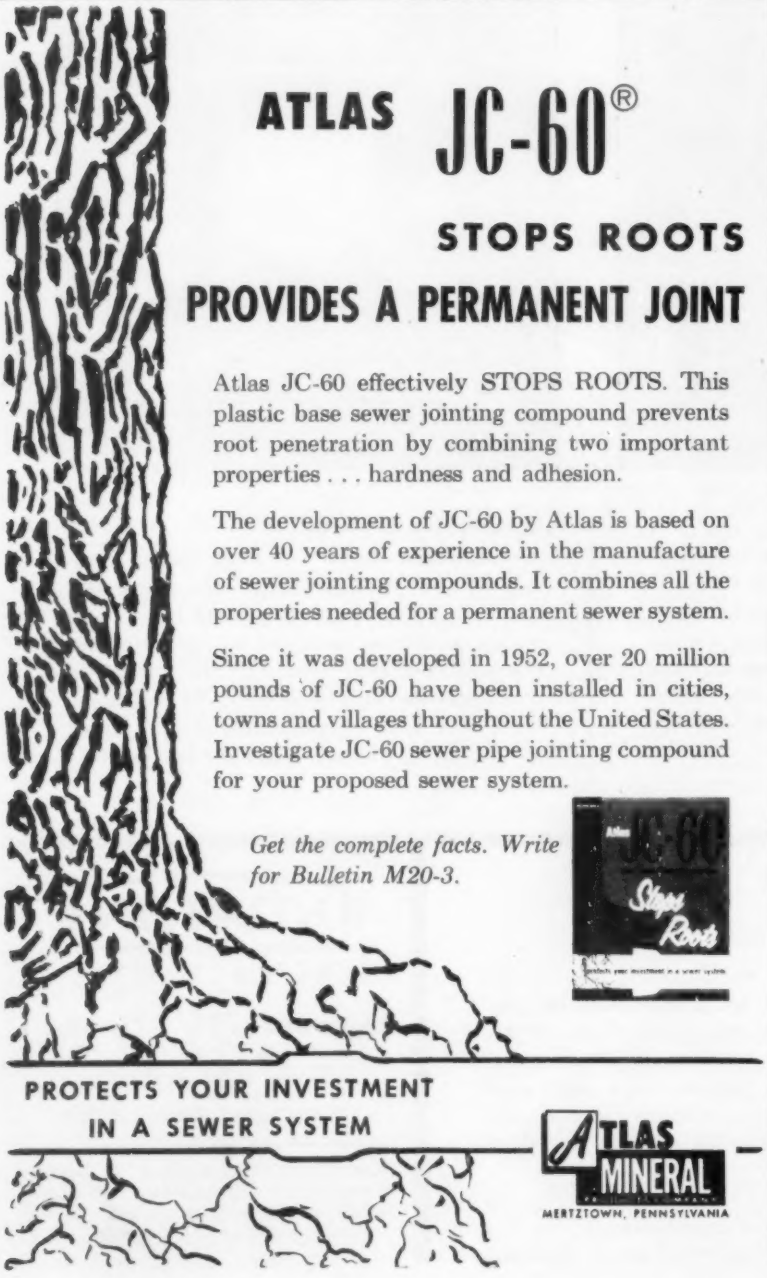
the soil and ground water conditions which not only aided the engineers in designing the sewer but also aided contractors in foreseeing the conditions they would encounter and so resulted in lower bids on a lump sum contract. Two siphons were necessary and these were designed to insure a minimum velocity of 1.5 feet per second.

An unusual feature of the design was provision made for future inspection, maintenance and cleaning of the sewer. Twelve structures 77 ft. square are provided at approximately 5,000 ft. intervals and at each end of each siphon. These permit entering the sewer by boat. To prevent corrosion of the concrete by hydrogen sulfide gas, the design eliminates, so far as possible, areas of excessive turbulence, and provides adequate forced ventilation to remove hydrogen sulfide from the sewer. Also it provides an acid-resistant surface on all parts of the sewer above and for 12 in. below the sewage surface at minimum flow. To accomplish the last, a vinyl plastic lining is used. For ventilation, a 50 hp fan capable of delivering 20,000 cu. ft. of air per minute will be installed at the down-stream terminus.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PROVIDES A PERMANENT JOINT
Atlas JC-60 effectively STOPS ROOTS. This plastic base sewer jointing compound prevents root penetration by combining two important properties . . . hardness and adhesion.
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PROTECTS YOUR INVESTMENT
IN A SEWER SYSTEM
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"Large Outfall Sewer for Los Angeles." By James Kesler, Project Eng. PUBLIC WORKS, February.

Intermittent Sand Filters

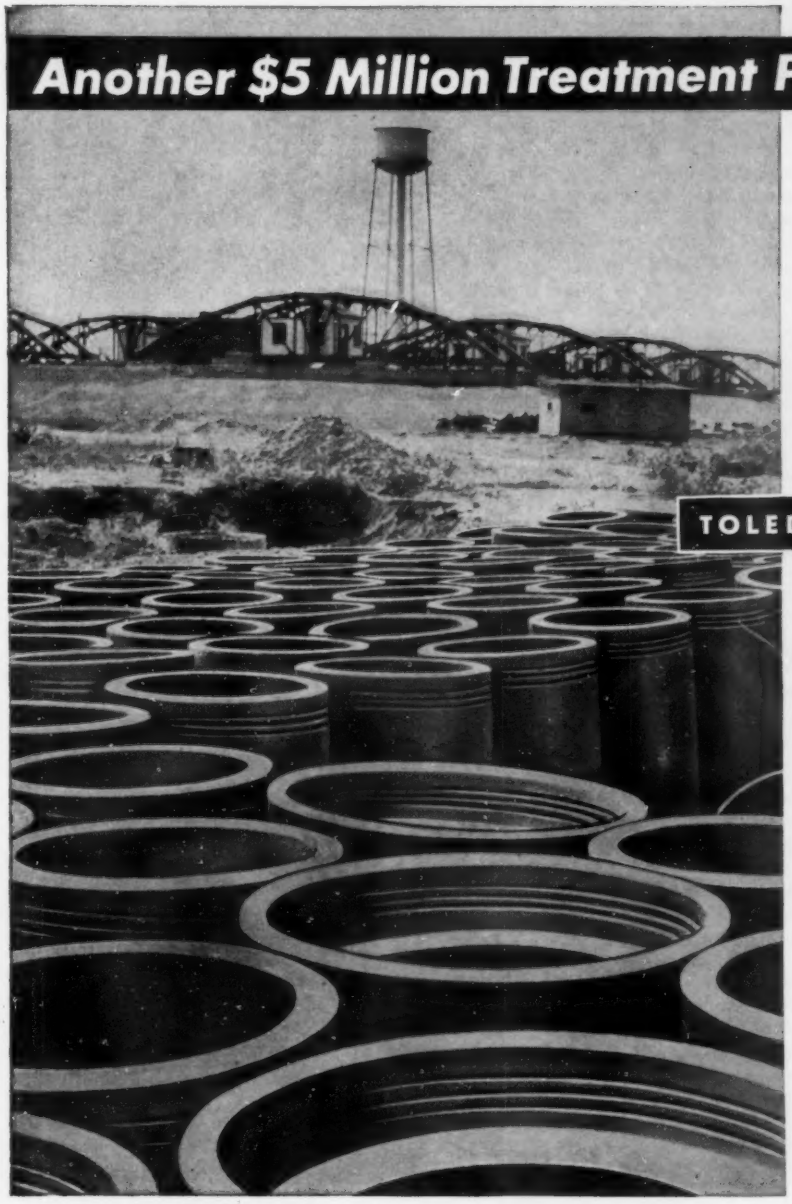
For small, scattered sewage treatment installations where high water tables make subsurface drainage impracticable, sand filters have many advantages. Little or no mechanical equipment is required; operation does not require skilled labor; maintenance is almost negligible; head losses may be kept low; flying insects are virtually negligible; the effluent is clear; there is no secondary sludge to handle; bacterial removal is usually sufficient to reduce the chlorination problem to a minimum. However, a large land area is required; satisfactory sand is not always readily available; the effect of weather on the operation is greater than for other types: weeds grow luxuriantly on the beds; a surface mat sometimes develops and must be removed; proper distribution of the sewage onto the beds is difficult. Filtration and adsorption were an important part in the purification, but biological oxidation is the most important action. Without the assimilation of filtered and adsorbed materials by biological agents, the filter beds would soon fail to function properly. The bacteria which effect the assimilation would themselves contribute to clogging if they were not consumed by protozoa and metazoa. The oligochiet worms appear to be the most important agents in consuming sludges and slimes, thereby keeping the bed open and active. The author discusses the theory of operation, bacteria, protozoa and metazoa.

"Intermittent Sand Filters and Their Biology." By Wilson T. Calaway, Asst. Prof. of Civ. Eng., Univ. of Florida. *Sewage and Industrial Wastes*, January.

Substitutes for Septic Tanks

Last October a conference of engineers, sanitary officials and manufacturers met in Los Angeles to discuss methods of eliminating the construction of septic tanks and cesspools in constructing small residential developments where there are no sewers available to receive the sewage. In one case, the township requires a subdivider to install "dry" sewers so designed as to permit connecting them to an interceptor when such shall be built, no houses to connect with the sewer until that time. However, the general opinion was that it would give

Another $5 Million Treatment Plant Expansion



...WITH CLAY PIPE ON THE JOB!

TOLEDO, OHIO is keeping abreast of the needs of its growing population with a $5 million bond financed program for expanding and modernizing its sewage treatment facilities. Work on this two-year project is underway now, and one of the first materials on the job was *Clay Pipe* for utility lines.

Why Clay? Because it's chemically inert—completely impervious to corrosives that damage ordinary pipe. It can't rust or rot . . . can't corrode or disintegrate. Its slick vitrified surface insures faster flow, with no chance for waste deposits to build up. Important, too, is its *exclusive long-term guarantee* —positive assurance of protection until years after the last revenue bond has been retired.

When *your* community plans new sewerage facilities, remember these important features. Guard the long-term investment by specifying Clay Pipe.

City Officials: Ollie Czelusta, *Mayor;*
Arthur H. Niles, *Sewage Disposal Commissioner*
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Contractor: Rust Engineering Co.

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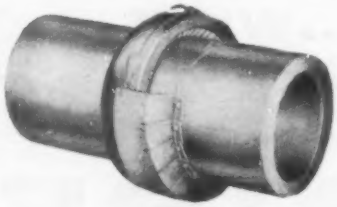

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immediate relief and cost less to build a small treatment plant at once than to install temporary septic tanks. An important problem in this connection is: who is to operate the plant? One solution is to have the developer assume this, reimbursing himself by charging sewerage fees. In any case, the state or local board of health should have control of the operation. One manufacturer of small plants estimates the cost of such a plant at $1 a gallon, or say $150 per capita. An engineer suggested that a developer set aside an area for future park development and use this for a temporary small plant with a stabilization pond for secondary treatment. Whatever the solution, it would be facilitated greatly by regional planning for future installation of interceptors and a joint treatment plant, and by enacting laws providing for such planning.

"Laterals Now, Trunks Later." *Engineering News-Record,* Jan. 17.

Modified Activated Sludge Plant at Austin

Austin, Texas built an activated sludge plant with 6 mgd capacity in 1936. The results were frequently poor, because of bulking sludge and other troubles, and in 1947 plain aeration only was used. The volume of sewage had increased to 9 mgd and there were complaints of pollution of the Colorado river from property owners down stream, and in December, 1947 the activated sludge process was resumed and intensive studies begun to try to find a procedure that would give better results. These led to the development of a process which has been named Bisorption. Briefly, the idea was to mix activated sludge with raw sewage for 15 to 30 minutes, settle the mixed liquor, discharge the overflow from the settling tank as final effluent, pump the settled sludge to an aeration tank for stabilization and reactivation. The plant was modified to provide for such operation in 1954. Operation since then has shown the following advantages over the conventional activated sludge process.

1. It is less temperamental. Fewer adjustments are required for a wide range in sewage flows and loads.

2. Shock loads do not upset the plant as readily and slugs of toxic wastes are not as critical.

3. It has eliminated sludge bulking and frothing has been controlled. Frothing of the greasy type has been experienced, but has been a serious problem only when toxic wastes have been received, even though the raw sewage grease content appears to be high.

4. It requires less than one-half of the aeration tank capacity required for conventional activated sludge. This has made possible a substantial saving in capital outlay during the recent plant expansion.

"Experiences with the Austin, Texas Bisorption Plant." By A. H. Ullrich, Supt. of Water and Sewage Treatment. *Water & Sewage Works,* January.

Sewering Metropolitan Cleveland

Cleveland, Ohio, has for some years been building and operating sewage treatment plants for its suburbs. Since 1950 it has spent $11,000,000 to provide complete treatment of the sewage received from these suburbs, the cost being met by sewer rental charges. In many ways this gradually developing method has proved unsatisfactory and a Regional Planning Commission was appointed by the county to make recommendations for a plan whereby the sewerage and water supply of the county could be provided as a comprehensive project. The plan recommended is that a regional commission of sanitation, separate from any existing political subdivision, be established to plan, build and finance the sewerage of Greater Cleveland. The present owners of existing sewers would be compensated for the cost of them by a 45-year lease by means of taxes levied against the benefited properties. It is optional for any outside community to join this venture now or at any future date.

"Solving Metropolitan Cleveland's Sewerage Needs." By George E. Flower, Com'r of Sewage Disposal, Cleveland. *Sewage and Industrial Wastes,* January.

Other Articles

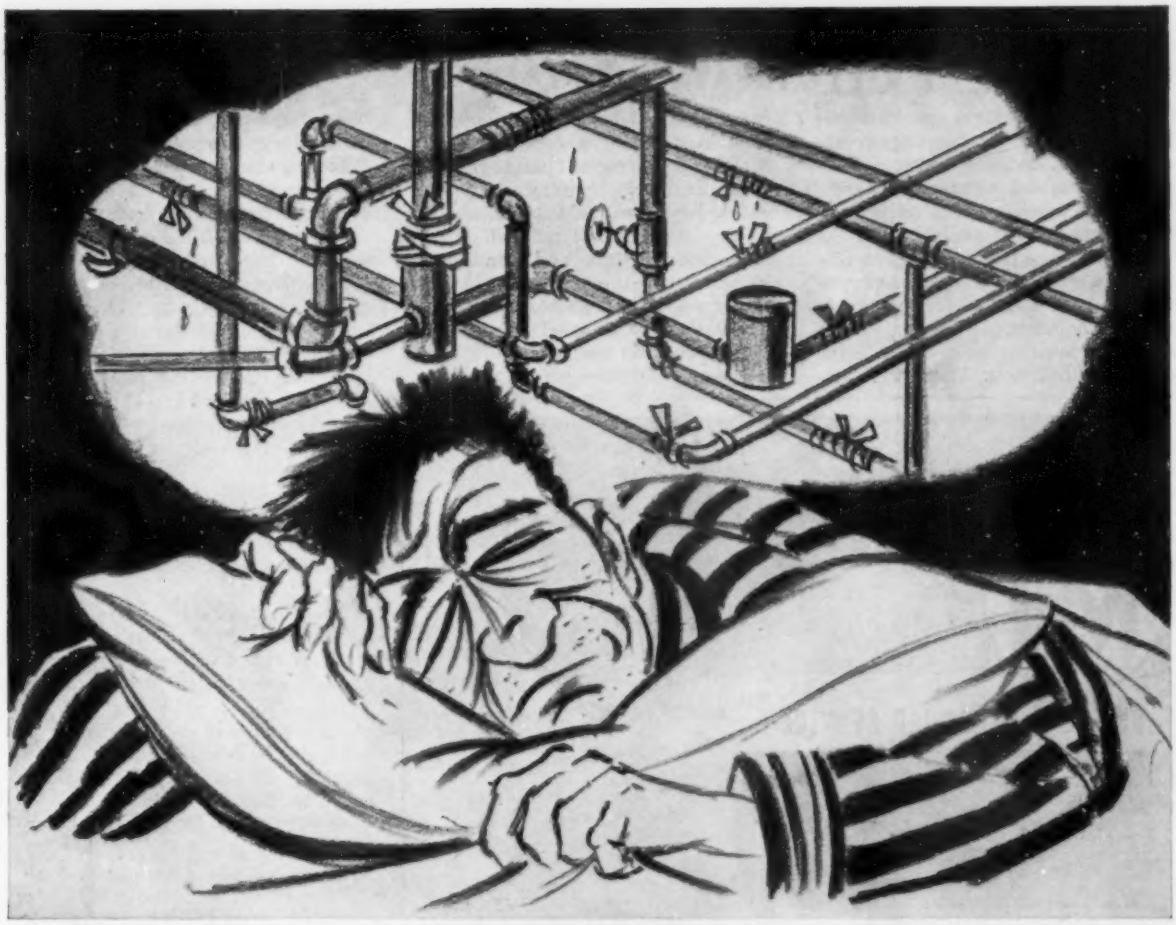
"Sewage Treatment Plant for a Growing City; **Erie, Pa.**" By Walter Rudolph. Public Works, February.

"Kessener Brush Aeration Plant at Davyhulme," Manchester, England. From the 1956 annual report. The Surveyor, Dec. 15.

"Dependable **Pumps and Motors** in an Expanding Sewage System", in Baltimore County Maryland. By George W. Welsh, Jr., Dept. Chf., Bureau of Operations. Public Works, February.

"Research on **Trickling Filters:** Alternating Double Filtration" at Water Pollution Research Laboratory by the British Water Pollution Research Board. By John Grindrod. Public Works, February.

"The **Settlement of Sewage,**" Theory and general practice. By T. Stones, Contractors Record, Jan. 9.

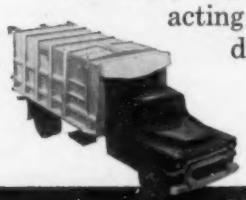


WHY BUY A PLUMBER'S NIGHTMARE?

Hydro E-Z PACK's simplified design keeps operating costs low!

There's no need to burden yourself with high maintenance costs when you select refuse collection bodies.

The Hydro E-Z PACK's compacting mechanism does not employ a maze of piping, interlocked valves, multiple cylinders, cables and other components requiring costly and frequent maintenance. Hydro E-Z PACK has only 2 working parts—a high volume roller bearing pump and a powerful double-acting telescopic cylinder, both designed for long life and trouble-free operation.



Ask your Hydro E-Z PACK distributor for all the facts. Or, write direct to Hydro E-Z PACK Company, Galion, Ohio.

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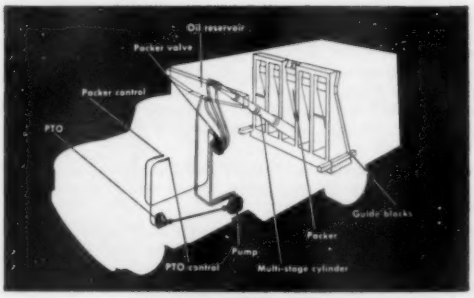


Simplicity is the keynote in Hydro E-Z PACK design. Yet, a refuse-crushing compacting pressure of 82,500 lbs. is attained.

HYDRO E-Z PACK Company • Galion, Ohio

PAINTS FOR A SEWAGE TREATMENT PLANT

BASED ON A survey and examination of numerous sewage treatment plants, detailed recommendations for new and maintenance painting of the many various units have been prepared by Tropical Paint Co. To simplify the problem, eleven different paint systems have been provided, each suitable for a certain set of conditions.

Useful painting hints precede the detailed directions. First, the surface must be clean and metals free from rust, since a dirty or rusty surface may cause paint failure; follow surface cleaning directions on the label. Second, surfaces should be dry when being painted except for certain paints and conditions. Third, when a liquid containing tank forms a wall or a part of a wall for a building, it is good practice to waterproof the inside of the tank to keep moisture from passing through the wall and showing on the inside. Fourth, where there is constant high humidity, and it is practically impossible to keep cold water pipes dry long enough to do a satisfactory job of painting. The following method is helpful under such conditions, but will not necessarily guarantee a perfect job:

(1) Remove all old paint, rust and scale by wire brushing and scraping; (2) wipe off all excess moisture with a dry rag; (3) apply a liberal coating of thinner (Tropical HS) or turpentine which, for a short time will replace the moisture and mix with the paint; (4) apply the recommended primer before the thinner has evaporated, preferably using a brush; (5) when the primer is dry wipe the surface with the thinner or turpentine, but rather sparingly as too much thinner may soften the primer; (6) apply the finishing coat.

The Tropical rubber base paints do not support the growth of fungus or mildew, but where a severe condition exists, a fungicide can be added to the paint. When any part of the inside of a tank is to be painted, it is best to paint the entire interior. Smooth, hard unpainted concrete floors should be treated with (Tropical) floor etches before painting as this makes paints and enamels adhere more tightly.

More than 150 items in a sewage treatment plant—metal, concrete, brick, plaster and wood—are enumerated in a recent manual issued by Tropical; and for each item there is a recommended painting system covering submerged or non-submerged, interior or exterior exposure.

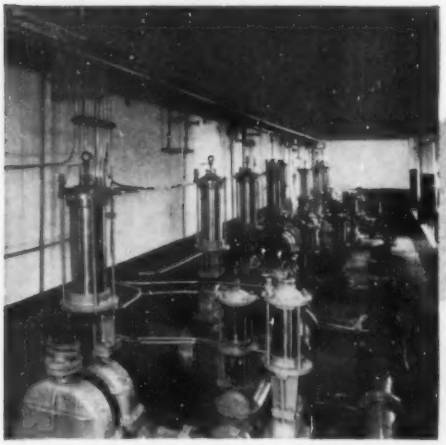
For the exterior of concrete digesters, for instance, No. 6 system is recommended, using for new work, two or three coats of Cementkote rubber base and for repainting one or two coats. For the submerged interior, No. 1 system is used. This calls for one or two coats of "77" black and for repainting one coat of the same. This is a special semi-liquid bituminous base coating reinforced with asbestos fibers and resistant to H_2S, chlorine, lime, oil, grease and moisture. One coat gives a thickness of 1/32 to 1/16 inch. The same No. 1 system is recommended for both metal and concrete covers of digesters, submerged or non-submerged. For the exterior portion of metal digesters, No. 7 is used; and for submerged portions, No. 2. System 7 is, for new work, one coat of ACB primer and one coat of Rhinamel; or the primer and one coat of Elastikote

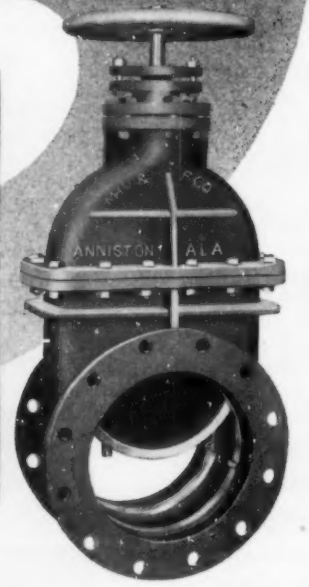
Reduce Valve Costs by Using

CLASS A or B

MH GATE VALVES

FOR LOW PRESSURE SERVICE





You can save in valve costs if your operating conditions permit installation of M & H Class A or B Gate Valves for low pressure service. These valves are lighter in construction than M & H Class C valves. In case of large valves installed in an elevated position, these lighter weight low-pressure valves may save you additional trouble and expense because you can use lighter supports.

The design, materials and workmanship are exactly the same as Class C valves. The only difference is the lighter weight body, bonnet and other parts of the Class A and B valves.

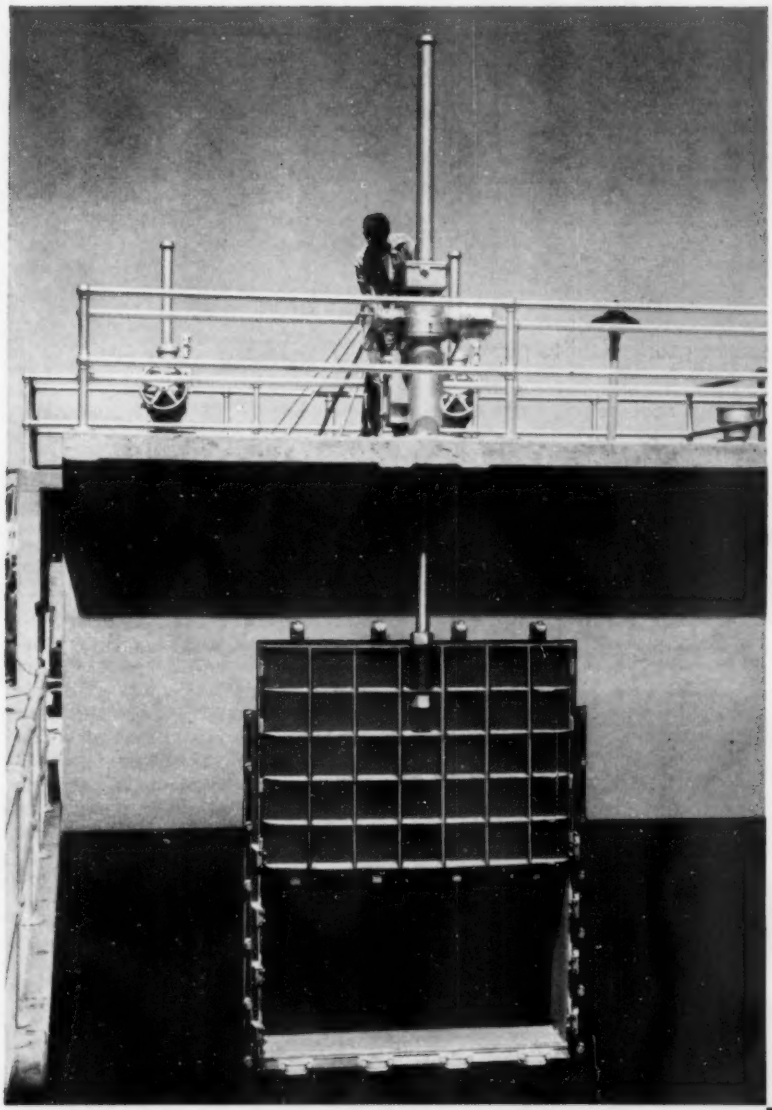
Class A is for 50 lbs. working pressure and receives 100 lbs. hydrostatic test. Class B is for 100 lbs. working pressure and receives 200 lbs. hydrostatic test. Furnished with non-rising stem, outside screw and yoke, or with sliding stem including hydraulic or electric motor operation.

M&H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA

SUBSIDIARY OF W WALWORTH

NEW ARMCO GATES

provide wide selection for water works and sewage plants



This gate, one of the many recently added to the Armco line, is installed at the Denver sewage treatment plant. It is designed for a maximum 50-foot face head and 15-foot back head.

You can easily select the right gate for water or sewage control from the recently expanded Armco Gate line. Armco has acquired the facilities for producing Pekrul Gates from the Morse Brothers Machinery Company of Denver.

This well-known line, added to Armco's already wide variety of gates, provides a convenient source for municipal water and sewage plant construction. Now Armco supplies sluice gates designed for 30 to 100 feet of face pressure, 5 to 30 feet of back pressure. Sizes range from 6- to 108-inch-diameter round openings; 6- by 6-inch to 108- by 108-inch square and rectangular openings. All models are designed for either manual or power-operated lifts. Bronze seating faces and wedge blocks are available.

In addition, Armco supplies flap gates, radial gates, corrugated metal pipe for sewer lines, and welded steel pipe for water lines in a wide range of sizes.

Write for helpful information applied to your requirements. Armco Drainage & Metal Products, Inc., 4147 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

ARMCO®

ARE YOU RESPONSIBLE FOR MEASUREMENT OF FLUID FLOW?

Gentile* **FLOW TUBES**

are impact-type head meters or differential producers.

They are designed to give you guaranteed high accuracy with lowest head loss.

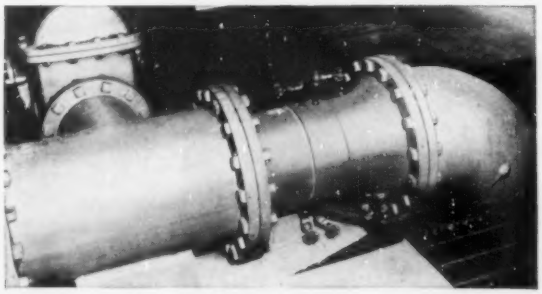
*Gen-Ti-ly

You also get:

LOW FIRST COST—Gentile Flow Tubes are economical to purchase.

LOW OPERATING COST—Gentile Flow Tubes require minimum maintenance. Where purging or back-flushing is a normal routine, the Gentile Flow Tube can be arranged for constant or intermittent purging without removing from the line.

LOW INSTALLATION COST—Gentile Flow Tubes can be installed with no straight run upstream or downstream, except where near valves or regulators.



Actual installation of a 16" Flow Tube for REVERSE FLOW. Note fittings (elbow and tee) are bolted directly to flanges of Flow Tube.

Gentile Flow Tubes can be furnished with or without suitable secondary indicating, recording, or totalizing instruments.

GENTILE Flow Tubes are manufactured exclusively by Foster Engineering Company

Write for further information or specific recommendations.

FOSTER ENGINEERING COMPANY

835 LEHIGH AVENUE, UNION, N. J.

AUTOMATIC VALVES • CONTROL VALVES • SAFETY VALVES • FLOW TUBES

interior and exterior aluminum. For repainting, the primer is omitted. Rhinamel is an enamel which comes in various colors. Strong hydrogen sulfide fumes may modify greens, yellows and oranges, so these colors are not recommended in closed rooms where such fumes may become strong. Other Rhinamel colors are not affected.

The No. 2 system recommended for new work consists of two coats of Metakote primer plus two coats of Metakote finishing; or two coats of Tropoxy No. 2 primer and two coats of Tropoxy No. 2 Enamel. On new work, four coats will give about a 5-mil thickness. On repainting, one coat of Metakote primer and one of Metakote finisher are recommended; or one coat each of No. 1 primer, 2 primer and Tropoxy No. 2 Enamel. It is noted that Metakote is resistant to lime, soda ash and chlorine, but the Tropoxy is even more resistant. Metakote primer and finish coats are not as easily applied as oil base finishes and they may sag a little and lack eye appeal, but they will give protection and long life.

These examples are enough to show the scope and value of this publication which is titled: "Recommended Maintenance Painting Systems for Sewage Treatment Plants."

• • •

New Texas State Health Department Building

Construction work has started on a $5 Million laboratory and administration building for the Texas State Department of Health. Health Commissioner Henry A. Holle predicts that the project would "inaugurate a bright new era of public health in Texas." The building program will involve two construction phases; the first, costing about $3 Million, will complete eight new buildings and partially complete a ninth. These will house laboratory facilities, central administration offices, and headquarters for the Food and Drug, Bedding and Dental Health Divisions. Federal funds in the amount of $1,134,000 helped finance the project.

• • •

Chain Reaction in Title Changing?

Dignity in job titles is the object of a recent move of the Wisconsin Restaurant Association. "Bus boys" are to be henceforth known as "sanitarians." What does this do to the title situation among sanitation personnel of the Wisconsin State Health Department?

TO MEET UNPRECEDENTED DEMANDS FROM INDUSTRY...

MAIN WATER SUPPLY LINES BY AMERICAN PIPE AND CONSTRUCTION CO.

The challenge of furnishing water to Rancho San Pedro Industrial Center, one of the nation's fastest growing planned industrial areas, located between Los Angeles and Long Beach, forced privately-owned Dominguez Water Corporation to plan extensive additional facilities for its water system. Since 1951 ideal conditions have attracted more than 50 important industries and 10,000 new homes to the area the company serves. Alert Dominguez Water Company officials anticipated increased industrial and domestic needs and launched an expansion program keeping pace with unprecedented demands.

For example, during the past 24 months, Dominguez has ordered American Concrete Cylinder Pipe for 11 separate installations, predominantly main water transmission lines. The company also tapped the Los Angeles Metropolitan Water District's supply lines for a supplemental source, using 42" American Concrete Cylinder Pipe. This augmented a system formerly supplied by wells and reservoirs alone.

T. V. Tallon, Chief Engineer and General Manager of Dominguez Water Corporation, has expressed his pleasure with the cooperation and service of American Pipe and Construction Co., "During our present expansion program, American Pipe has consistently met our delivery deadlines – some of them urgent – yet held to the same high manufacturing standards as first attracted American to our attention."

American Pipe makes available 50 years of experience and extensive production facilities to help solve any water supply problem. There is a type of American Pipe to meet any requirement. Write or phone for information.

American
PIPE AND CONSTRUCTION CO.

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Mail address: Box 3428 Terminal Annex, Los Angeles 54

Main offices and plant:
4635 Firestone Blvd., South Gate, Calif. Phone LOrain 4-2511

District sales offices and plants:
Hayward and San Diego, Calif., Portland, Ore., Phoenix, Ariz.

District sales representatives:
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CONCRETE PIPE FOR MAIN WATER SUPPLY LINES, STORM AND SANITARY SEWERS, SUBAQUEOUS LINES

Checking Pavement Smoothness

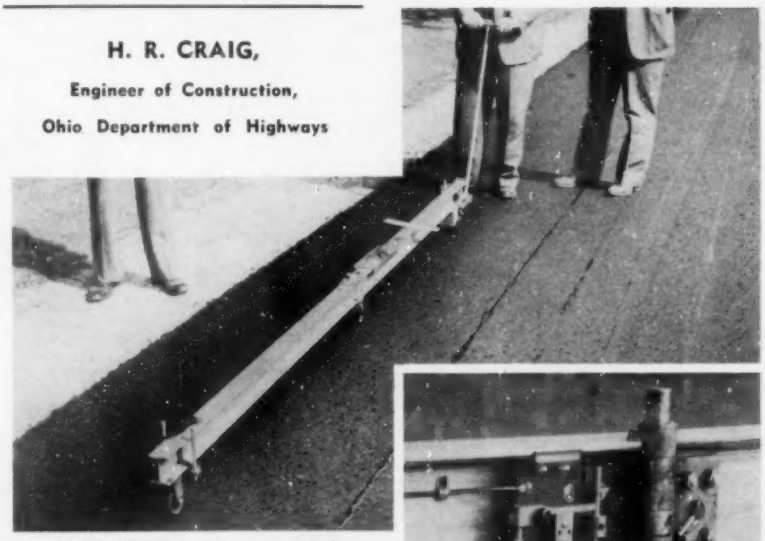
H. R. CRAIG,
Engineer of Construction,
Ohio Department of Highways

FINISHED surfaces of pavements in Ohio are required to conform to a template cut to the cross-section and applied at right angles to the centerline; and to a straight-edge applied parallel to the centerline. Completed pavements are not checked with a roughometer. However, completed pavement surfaces are checked with a device termed a "Profilometer".

During the construction of flexible pavements, the cross section of all courses is frequently checked with a template. The profile is continuously checked with a straight-edge applied parallel to the centerline. Where the surface texture of a pavement course will allow, checking of the profile is performed with a device called a "Bumpometer" by the Highway Department. This device is operated along lines parallel to the centerline of the pavement. For half width of the pavement, three lines equally spaced suffice for a lane width of 12 feet.

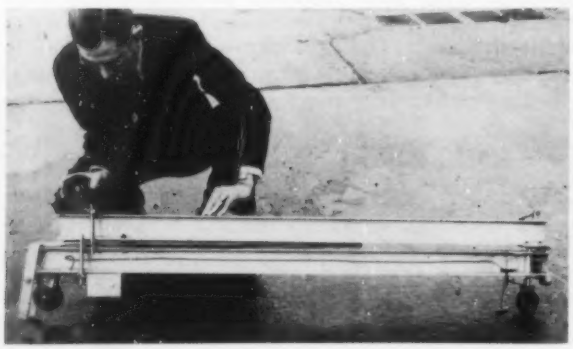
The Bumpometer is constructed on a 3-inch aluminum alloy I-beam, 10 feet center to center of end wheels. The beam is hinged near its center and can be folded for storage and transportation. Halfway between the centers of the end wheels, there is suspended a third wheel capable of moving freely in a vertical plane. The movable wheel carries an electrode between fixed electrodes. The fixed electrodes are adjustable to any surface tolerance. The Bumpometer indicates high spots in excess of surface tolerance with a high pitched buzzer and low spots with a low pitched buzzer.

In the construction of rigid pavements the proper cross-section is set in the screed of the finishing machines. Straight-edging of the surface, parallel to the centerline, follows as part of the finishing operation. As soon as curing will allow, the surface profile is checked with a Bumpometer similar to the one used to check asphaltic surface courses. Surface tolerance for rigid pavements is ⅛ inch in 10 feet, parallel to the centerline. The Bumpometers used to measure this small deviation from a true line are built on a 5-inch magnesium alloy I-Beam.

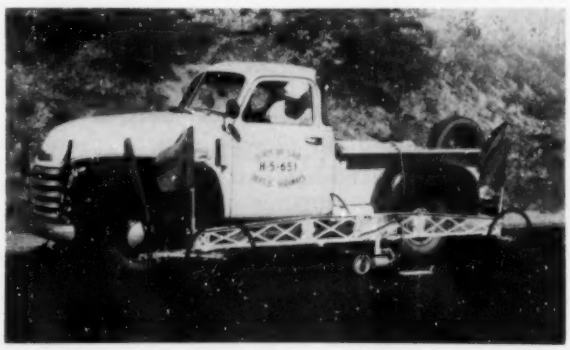


● **BUMPOMETER is being operated on an asphaltic concrete surface, above. Testing is parallel to the center line of the pavement. At right is shown the floating center wheel arrangement and the hinging device described in text.**

The surfaces of all completed pavements are checked with a Profilometer. The mechanism of the center wheel of the Profilometer is very similar to that of the Bumpometer. Instead of actuating a buzzer, the center wheel of the Profilometer actuates a spray gun. In operation the device marks all high and low places which are in excess of surface tolerance with traffic paint. For a pavement 24 feet wide, the Profilometer is operated in four lines parallel to the centerline. High areas are corrected by grinding. Low areas, in flexible pavements, are corrected by removal and replacement of the surface course. This method of pavement surface checking has been found to be adequate and the Ohio Department of Highways has no present plans for a change.



● **FOLDING device permits easy transportation of tester.**



● **PROFILOMETER is attached to truck for checking surface.**

Asphalt Canal Linings Prevent Seepage

An asphalt canal or ditch lining is a membrane 1/4 to 3/8 in. thick, built up by spraying suitable asphalt at high temperature directly on the prepared subgrade. This membrane then is covered with layers of earth or gravel to hold it in place and protect it against weathering and livestock damage. Average cost of this type of lining is 80 cents per sq. yd. with a maximum of $1.50 per sq. yd.

Another application is represented by prefabricated linings which are particularly useful for small canals and laterals. In recent years an exposed type of prefabricated lining, manufactured in sheets 3 ft. wide and ranging in length from 8 to 14 ft. has been introduced. These half-inch thick panels of asphalt-saturated felts with filler cores handle easily and conform to the contour of the soil at temperatures as low as 20°F.

Under some conditions where a soil sterilant is not used on the subgrade, asphalt linings are damaged by tule and cat-tail weeds which find germinating conditions beneath these asphalt covers, grow and pierce the lining. However, a medium hard cutback asphalt, compacted to a reasonably high density, can withstand weed pressures. An asphalt of similar consistency, also has proved highly resistant to mud-curl, another lining hazard. Mud-curl occurs where there is a daily cycle of wetting and drying with deposits of mud. As the mud dries, it has a tendency to curl, bringing with it small quantities of asphalt surface. Other tests have developed that certain aggregates used in asphaltic concrete mixes were hydrophilic (water-loving) and tend to attract and retain water. Use of these renders the lining less impermeable and reduces its efficiency.

• • •

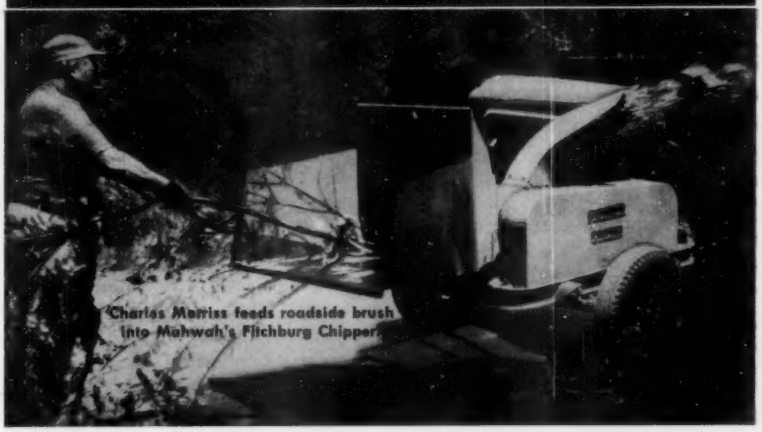
Corner Lot Assessment Practices

At a meeting of the League of Minnesota Municipalities in Wheaton, corner lot assessment practices were discussed. In Morris, an adjustment is made on water and sewer improvements, but sidewalks are charged for on a front foot basis. No assessment is made for water mains by Breckenridge; both sides of a corner lot are assessed for sidewalks; and all lots are assessed equally for street improvements. Hoffman assesses corner lots at 1½ times the narrow side, that is a 40-ft. front lot is charged for 60 feet.

INSTANT BRUSH DISPOSAL

FITCHBURG CHIPPER

DOES 3 MEN'S WORK



Charles Morriss feeds roadside brush into Mahwah's Fitchburg Chipper.

When you want to cut brush disposal cost, investigate a Fitchburg Chipper, a real time and labor-saver.

John Glasgow, Superintendent of Public Works, Township of Mahwah, New Jersey, says: "Now I chip brush instead of putting it on piles and waiting for wet weather to burn. I mention wet weather because of fire hazard.

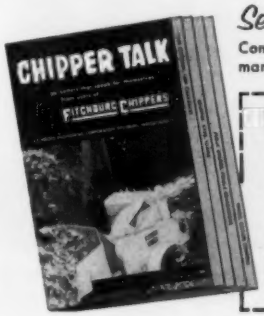
"The Fitchburg Chipper was purchased in May 1954. It will take only a short time to pay for itself. I hired 6 men to cut and clean up brush, now with the Chipper I only need 3 to do the same work."

You, too, can save man hours where there is a need for line clearance operations, road clearance, thinning out woodlots, or handling the brush problem on parkways, city streets, etc.

The Fitchburg Chipper is designed for rugged use, and in models priced from $960 upward.

Learn about Fitchburg's exclusive spring-activated feed plate, which makes chipping of all sizes of wood (up to the machine's rated capacity) simple. Another exclusive feature is the hinged feed apron which can be closed when not in operation.

Read how others cut labor costs with a Fitchburg Chipper—the only chipper that gives you a one-year guarantee.



Send For New Free Booklet - "CHIPPER TALK"

Complete cutaway color drawings and photo copies of letters from many municipalities, commissions, counties, contractors, tree care men.

FITCHBURG ENGINEERING CORPORATION

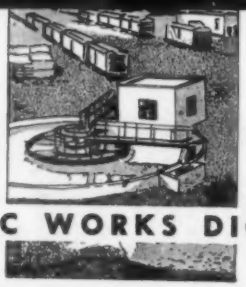
Dept. PW-37, Fitchburg, Massachusetts

Send my free copy of "Chipper Talk" to:

Name_____ Position_____

Address_____

Town or City_____ State_____



PUBLIC WORKS DIGESTS

THE INDUSTRIAL WASTE DIGEST

Air Pollution Studies and Control Methods

Alleged air pollution from a rubber industry in Louisville, built largely after the war and concentrated in a dense network of plants, resulted in the establishment of a county control commission. Under PL 159 the District, in cooperation with local and state health departments, initiated a plan of studying the problem, the objectives being to determine air quality in affected areas and to relate air quality to meteorological factors. The automotive exhaust problem has been receiving attention in metropolitan areas. The exhaust fumes contain hydrocarbons, nitrogen oxides, carbon monoxide and a variety of organic materials which damage vegetation and cause eye irritation and rubber cracking. Consideration of a strict motor vehicle code in Detroit with police department enforcement led to a cooperative effort among engine and truck manufacturers and the Automobile Manufacturers Association to develop control methods. A training film was produced by the AMA to illustrate to police officers the difference between necessary and unnecessary visible emissions. The automotive industry, through studies, established the cause of unnecessary visible emissions: excessive oil consumption, overfueling of diesel engines, restrictions on the inlet air system, substandard fuel, overloading, cold operation and mechanical deterioration. Portable guide materials for grading smoke emissions were prepared for enforcement officers. Industries processing rock phosphate, fluorspar and other ores containing fluorine are the main contributors to air pollution by fluorides. Fluorides used in the production of steel and aluminum are subject to loss to the atmosphere. This type of pollutant is easily identifiable by biological effects in the neighborhood of the industry. Continuous sampling of vegetation is the most satisfactory method of evaluating the problem.

"Clean Air." A condensation of four papers presented at a meeting of the Air Pollution Control Association by Dr. A. T. Rossano, Benjamin Linsky, Dr. F. W. Bowditch, and Dr. C. R. Williams, *Public Health Reports*, January.

Coke Production Waste Guide

By-product coke results from heating bituminous coal in closed ovens. The liquid condensed from volatile products obtained is referred to as ammoniacal liquor, from which ammonia is recovered by distillation. The quantity of polluting material in the ammoniacal liquid varies directly with the volatile matter in the coal used, and the production of phenols and cyanogen compounds vary inversely with the temperature of carbonization. The pick-up of pollutional material by the ammoniacal liquor in the indirect ammonia recovery process can be reduced by preventing contact of ammonia scrubber water with flushing liquor. Solvent extraction dephenolization systems can be designed to remove more than 98 percent of phenols. The use of cooling towers and closed systems prevents the carry-over of pollutional material from the gas-final cooler water. Benzol plant wastes, though small in volume, are highly toxic. While it is possible to dispose of all liquid wastes in a closed coke-quench system, some of the phenolic materials are absorbed by the coke and ap-

Monorail Electric Hoist Handles Refuse Economically

PUSH-BUTTON operation of a simple monorail system with an electric hoist, at the incinerator serving the Gloucester (N. J.) City Sewerage Authority, handles 23 tons of refuse daily from the city and surrounding industry. Working from a control booth on a level approximately 20 feet above the receiving pit, one of two operators moves the hoist over the pit, lowers the scoop and picks up a load of 400 and 450 pounds. The operator then raises the load, moves the hoist a distance of 30 feet along the monorail and lowers the loaded carrier over the opening of a furnace at the opposite end of the building. The scoop jaws open mechanically as they touch the charging hopper, the complete cycle requiring about three minutes. The second man in the operation works outside the control booth picking up spilled scraps and guiding the scoop to the unloading position. The installation utilizes a two-ton capacity Yale Cable King electric hoist with a motor driven trolley which carries the scoop.

● **INCINERATOR charging hoist at Gloucester, N. J., has 3-min. cycle.**

The Gloucester Authority put the system in operation in 1951. Since that time it has been in constant operation with the exception of a brief period in 1956 when the hoist was overhauled. The initial cost breakdown for the system was approximately $4,500 for the hoist and scoop and $14,000 for the installation of the monorail and supports.

P.F.T.

NEW DEVELOPMENTS IN SEWAGE TREATMENT

P.F.T. prefab aluminum roofing being installed at the Mill Creek Sewage Treatment Plant, Cincinnati, Ohio. Twelve 110-ft. P.F.T. Floating Covers are equipped with this new roofing. Consulting engineers: Havens and Emerson, Cleveland, Ohio.

Now! Lifelong decks for floating covers with new P.F.T. prefab metal roofing!

P.F.T. aluminum roofing is as permanent as the floating cover itself. Unlike conventional job-built decks, there is no wood or composition to rot. P.F.T. aluminum roofing requires little or no maintenance.

This new P.F.T. roofing consists of sturdy prefabricated panel sections; heavily embossed aluminum top sheets, and corrugated supporting bottom sheets. An inch-thick layer of Fiberglas insulation fills the space between. A liner of aluminum foil gives additional protection against heat loss. Helps maintain proper digester temperature control, and keeps heating costs down.

Shipped in easily handled sections, P.F.T. aluminum roofing installs quickly. Each piece is clearly marked for fast, accurate assembly at the plant site. Cut-outs and trim for manholes, sampling wells, hatch framing and other openings are shop fabricated. Aluminum ventilators are provided at the center, and over the sump wells at the rim. A 19″-wide service walkway also is furnished, extending from rim to center dome.

Section of P.F.T. roofing showing (1) aluminum top sheet, (2) inch-thick Fiberglas insulation, (3) aluminum reinforcing channels, (4) corrugated supporting ribs.

P.F.T. prefabricated aluminum roofing is available for both new and existing floating covers. For long range economy, it is the most permanent, best insulated roofing available. For complete details, write today for newly published, illustrated, 12-page Technical Bulletin No. 333.

waste treatment equipment exclusively since 1893

P.F.T.

PACIFIC FLUSH TANK CO.
4241 Ravenswood Avenue
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PORT CHESTER, N. Y. • SAN MATEO, CALIF. • CHARLOTTE, N. C. • JACKSONVILLE • DENVER

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MOW WITH DANCO!

Ideal for mowing highway or railroad right-of-way, parks, airports, and other large grass areas.

The Danco center mounted rotary mower gives far greater stability and maneuverability over rough terrain and slopes. The mower is quickly raised or lowered with hydraulic control from tractor seat. Available in 66" or 96" cut with cutting height adjustable from two to twelve inches. With a center mounted Danco you can mow up to 30 miles of right-of-way per day.

DESIGNED FOR LONG, TROUBLE-FREE SERVICE

Engineered and built to meet highway department specifications. Hardened spring steel blades and non-wrap spindle assures peak performance.

Danco mowers are designed for use with Allis-Chalmers, J. I. Case, John Deere, Ford, Farmall, Minneapolis-Moline and Oliver, tractors. Write for descriptive literature.

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MECHANICAL EQUIPMENT BY ROBERTS FILTER MFG. CO. DARBY, PENNA.

Synonym for...

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MANUFACTURING CO.

640 COLUMBIA AVE.

DARBY, PA.

HEAVY-DUTY

ELLIS PIPE CUTTER

FOR CUTTING LARGE SIZE PIPE

Drop-Forged Frame and Links

Long-Lasting Cutter Wheels

Makes a Hit With Water Works Men

Cuts Pipe In or Out of Ditch

TWO SIZES

No. 01 for 4" to 8" Pipe

No. 1 for 4" to 12" Pipe

Write for Circular and Price List No. 35PW

ELLIS & FORD MFG. CO.

FERNDALE 20, MICH.

pear in the blast furnace gas wash water. Ammonia still wastes are amenable to biological treatment when diluted with domestic sewage. The evaluation of both phenolic and non-phenolic constituents in coke plant wastes is necessary to estimate their taste and odor potential.

"Industrial Wastes Guide—By Product Coke Industry." By H. H. Black, G. N. McDermott, C. Henderson, W. A. Moore, and H. R. Pahren, R. A. Taft Sanitary Engineering Center. *Sewage and Industrial Wastes,* January.

Review of Metal Products Waste Treatment Methods

"Contaminating" wastes from metal finishing processes include acids, alkalies, cyanide and various metals, with concentrations varying with the amount of drag-out, volume of production and frequency of spent solution dumping. Drag-out losses can be reduced through proper racking of parts, providing sufficient time for draining, use of smooth racks and use of stationary recovery rinses following plating baths. Water use can be minimized by countercurrent or parallel rinsing, spray rinsing, spray and dip rinsing, and air agitation in rinse tanks. Ion exchange methods have been successful for recovery of copper, nickel and chromium wastes. Metal-finishing wastes can be treated most expediently if separated into acid-chromium and alkaline-cyanide components. Treatment of the former involves reducing hexavalent chromium to the trivalent form in an acid solution and precipitating it in an alkaline solution. Alkaline-cyanide wastes are treated by destroying the cyanides and precipitating the metals present as hydrous oxides. The most practical method of treating steel mill rinse waters is to neutralize the free acid and precipitate the iron with lime. Brass mill wastes are treated with sulfur dioxide to reduce the chromium to the trivalent form. The sludge is dewatered in a vacuum filter and the chromium is oxidized back to the hexavalent form in a gas-fired furnace for recovery purposes.

"Metal-Finishing and Brass Mill Wastes." By M. E. Hupfer, Connecticut State Water Commission. *Sewage and Industrial Wastes,* January.

IBM Wins Plant Award

The success of International Business Machines in providing a manufacturing plant in which civic responsibility and worker well-being were realistic goals was recognized

by Factory Magazine's 1955 Significant Plant Award. A study of existing waste treatment installations by the consulting engineers indicated the method should involve concentrating dilute solutions by ion exchange and destroying the concentrated material by batch treatment. Adoption of this method has advantages in space saving and economies through chromic acid recovery and re-use of deionized wastes. The general rinse water treatment system consists of a surge tank, septa-type filters for removing organics, separate cation and anion exchange units, an emergency acid clearwell and a deionized water clearwell. The chromate recovery system involves similar units, omitting the filter units but utilizing caustic recovery and a chromate evaporator. Continuous cyanide destruction by chlorination at pH 11 was chosen because of space requirements. Redox instruments are used to proportion the chlorine dosage to the cyanide concentration and to monitor the effluent. Waste acid is neutralized to pH 8, resulting in precipitation of metallic hydroxides. The sludge is concentrated and dewatered by means of a vacuum filter, precoated with a diatomite filter aid.

"Treatment of Plating Wastes from Computer Manufacturing." By L. J. Hosman, Smith, Hinchman and Grylls, Inc., Detroit and R. J. Keating, Graver Water Conditioning Co., N. Y. *Sewage and Industrial Wastes*, January.

• • •

Dissolver Makes Possible Fluoridation by Fluorspar

A new device has been developed to reduce the cost of adding fluoride to city water supplies, from an average of 10 cents per person per year to three cents. Previously it was not practical to use fluorspar in water supplies, despite its lower cost, because it does not dissolve readily With the new equipment, the fluoride in the fluorspar becomes available in the presence of alum. After an alum solution has dissolved the fluorspar, the fluoride solution is added to water in predetermined dosages by a solution feeder. The fluorspar dissolver was developed by F. J. Maier, Sanitary Director, and E. Bellack, Chemist, both of the Division of Dental Public Health, Public Health Service. The apparatus has been field tested for more than six months, is not yet on the market, but its manufacture by private industry is expected to begin in the near future.

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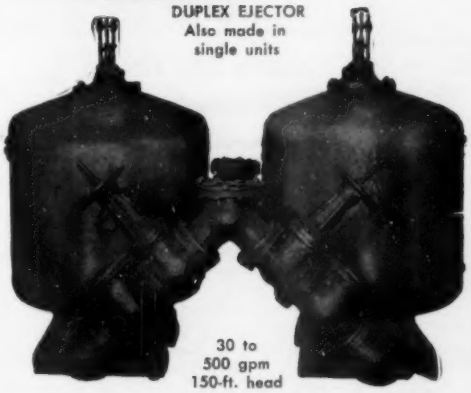

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NERVE GAS *and*

PUBLIC WATER SUPPLIES

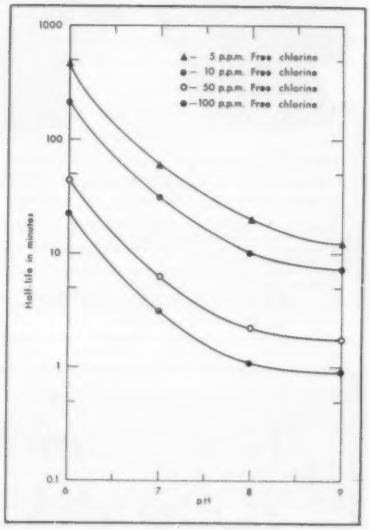
JOSEPH EPSTEIN, M, S.,
Chief, Sanitary Chemistry Branch,
Biochemical Research Div.,
Chemical Warfare Laboratories,
Chemical Center, Md.

WATER WORKS engineers must be concerned with the nerve gases. Other chemical agents, because of low toxicity or rapid hydrolysis to relatively non-toxic products are unlikely to be dangerous, especially in large volumes of water. For instance, hydrogen cyanide and cyanogen chloride are extremely toxic if inhaled; but it would take one ton of either, uniformly dissolved in a 10 million gallon reservoir to reach a concentration of 25 ppm which is physiologically tolerable for the average person. It would take 43,200 tons to produce a 25 ppm concentration in Boston's Quabbin Reservoir of 415 billion gallons; and 13,500 tons for New York's Ashokan Reservoir. However, in reservoirs of less than a million gallons capacity, dangerous contamination is possible.

Even the highly toxicant and vesicant Lewisite presents little danger for it hydrolyzes rapidly, and as much as 20 ppm can be tolerated. The nitrogen mustards present more of a problem, but tests to detect them and methods of removing or neutralizing them have been developed; and the amounts required to create a hazard in a large reservoir would be very great.

In this discussion of the properties and behavior of the nerve gases, Tabun and Sarin, in water, the concentrations will be of the order of 15 to 30 ppm unless otherwise noted. The level of tolerance of Sarin in water has been set at 0.5 ppm, with the limitation that the total volume of water taken per day will not exceed 5 liters; and that the period of ingestion will not exceed three days. Except for the unlikely case of recontamination, the concentration for the second and third days will be lower than on the first day, due to hydrolysis, the products of which can be considered non-toxic. Tabun is about one-fourth as toxic as Sarin by the oral route.

In the absence of large quantities of salts in the water, the half-life of Sarin in water at 25°C will be about as follows: at pH 7, 54 hours; at pH 8, 5.4 hours; at pH 9, 0.54 hour. Between pH 4.0 and 6.5, the hydrolysis rate of Sarin is at a minimum, and the half-life is about 175 hours. At a given pH, the hydrolysis rate will vary by a factor of about 2 for each change of 10°C. The presence of metals in the water may affect the half-life materially. Cupric, manganous, magnesium and calcium ions are very effective catalysts whereas sodium and potassium ions are ineffective. Cupric and manganous salts are more effective in neutral or slightly acidic waters; magnesium and calcium in alkaline waters.



● **RELATIONSHIP between the half-life of Sarin at 25° C. and the pH of water for different concentrations of free chlorine. Sarin is a nerve gas.**

This is an abstract of an article by Mr. Epstein in the October, 1956, issue of Public Health Reports.

At pH 6.5 and 25°C, the half-life of Sarin in water containing only 1 ppm cupric ion is 2 hours compared to about 175 hours in the absence of the metallic ion. At pH 8.5 and 25°C, the half-life of Sarin may be decreased from 1.7 to 0.5 hr. by the addition of 100 ppm magnesium ions. Thus in waters of high magnesium or calcium ion content, or in waters containing even trace quantities of some heavy metal ions, the hydrolysis rate of Sarin may be much more rapid than stated previously. The half-life of Tabun in the pH range of 4.0 to approximately 8, at 20°-25°C is 2-4 hours.

Detection—Although a nerve gas attack might alert water works personnel, Sarin in water at concentrations up to at least 35 ppm is not detectable by odor or taste. Tabun, which possesses a fruity odor, is detectable by smell in rather low concentrations. Also, suspicion as to potability might be aroused by the odor of hydrocyanic acid which is formed by the hydrolysis of Tabun. Unlike Sarin, Tabun will alter the chlorine demand of the water. If appreciable quantities of Sarin have hydrolyzed, and if the contaminated water is of low buffer capacity, the low pH of the water may serve as a warning. An abnormally high fluoride ion concentration in the water should also arouse suspicion.

Both Sarin and Tabun in the presence of their hydrolysis products may be detected and estimated rapidly and in very low concentrations by their reaction with benzidine or o-tolidine and alkaline peroxide solutions. By using this method, the author and his coworkers have been able to estimate quantitatively as little as 0.1 ppm of Sarin in water.

Decontamination—At least two feasible methods for the destruction of Tabun and Sarin in water supplies are available. Both methods are based on an acceleration of the normal hydrolysis rate and involve chlorination or alkalinization. Chlorine will not react with Sarin, but hypochlorite ion is a very effective catalyst for the hydrolysis of both Sarin and Tabun; combined chlorine, as chloramine T, exert practi-

cally no catalytic action; pH is important. Only one-eighth the chlorine concentration is required at pH 7.0 as is required at pH 6.0 to give approximately the same rate of destruction. Where time of treatment can be extended to several hours, much lower chlorine concentrations can be used. For example, by maintaining the water at pH 8.0, the addition of 5 ppm of chlorine will reduce the concentration of Sarin from 30 to 0.1 ppm. in approximately 3 hours.

Chlorine as hypochlorite will destroy Tabun and the cyanide produced upon hydrolysis will consume the chlorine. Satisfactory procedures have also been developed for decontamination of Sarin, using hypochlorite. For rapid decontamination, 100 ppm of chlorine was used; following the reaction, the chlorine was reduced to less than 1 ppm by activated carbon.

Another procedure for decontamination is to raise the pH of the water to about 10 with soda ash, lime or magnesium hydroxide; allow the Sarin or Tabun to hydrolyze; when tests indicate that the nerve gas concentration is 0.1 ppm or less, use a coagulant, such as ammonia alum or ferric chloride; then filter and chlorinate. The rate of hydrolysis is followed by means of tests and the quantity of alkaline material added is regulated by the rate of hydrolysis. The alum or ferric chloride not only functions as a coagulant but also reduces the pH of the treated water to normal.

Water treated by either of the methods described is potable and palatable.

• • •

How Engineering Can Save Money In Drainage Structures

This article has been condensed from a paper by Paul Van Roekel, Howard County Engineer, Cresco, Iowa, at the National Highway Conference of County Engineers and Officials, Mackinac Island, Mich.

DURING THE WAR many of you had occasion to be in one of the branches of the armed forces. You know from first hand experience the joke about there being only two sizes of clothing issued, too big or too small. You have all seen the same mistake made in the design and construction of drainage structures, too big or too small, too high or too low, too wide or too narrow. There is nothing more embarrassing to the highway official or more convincing to the public of wasted funds, than to have a newly completed drainage structure fail. Na-

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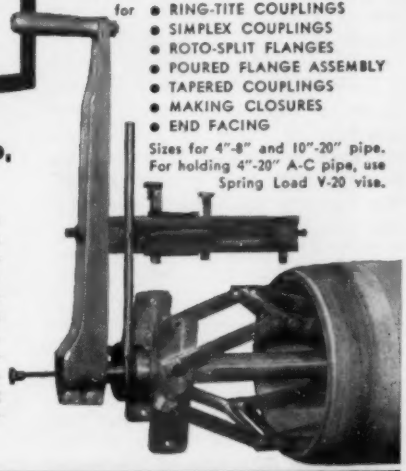

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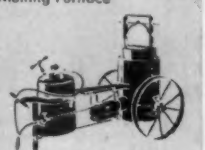
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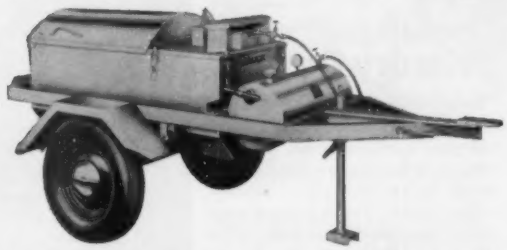

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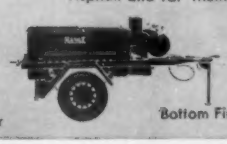
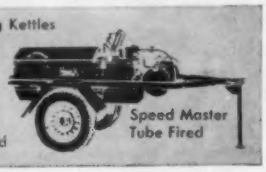

Bottom Fired


Speed Master Tube Fired

turally, to change, repair, or replace a drainage structure costs money, and by avoiding any mistake, the highway official is saving a considerable amount of public funds. Following an engineering approach to the problem is the best method of preventing costly errors.

Recently the Iowa State Highway Commission completed and distributed a report on the estimation of pile lengths by analysis of soil soundings. By using these data, an engineer can determine the length of piling needed for any bearing value by adding up the estimated safe bearing value per foot of pile for each soil type shown on the soundings. By using this method, pile cut-offs have been averaging less than three feet.

The Iowa Highway Research Board had as its first project a study of the magnitude and frequency of floods on all the major Iowa rivers and is now working on smaller streams and drainage areas. By using the tables in their report it is possible to estimate the magnitude and frequency of floods at any bridge site. The size of the bridge is then determined by what length of time the designer wants to allow between floods that would exceed the design capacity of the bridge. It is possible to estimate the size needed for a five-year flood frequency up to a 100-year flood frequency. For county roads, depending on their importance, the bridges are usually designed for from 10 to 50-year floods.

Another study conducted by the Highway Research Board makes use of the temporary impounding of water up stream from a culvert and high fill in hilly regions. This makes a reduction in culvert size possible and controls erosion. To aid the highway engineer, 129 culvert design diagrams were made giving the culvert size needed for any drainage area of a given size, storage channel of particular shape, assumed height and run-off frequency.

At the present time considerable research is being done on culvert inlets and also on the proper slope needed to increase efficiency. The efficiency of the concrete box culvert can be increased considerably if an improved inlet design can be developed that is economic to construct. The slope through any culvert has considerable bearing on its efficiency and by installing at the correct slope the best results can be obtained.

Probably the newest development in bridge and culvert design is the use of aerial photography. Locations, drainage area, and run-off factors are easily determined.

There are many other recent developments in bridge and culvert design. The Bureau of Public Roads and most of the State Highway Departments have made good progress in adopting them. However, the county highway official, burdened with a multitude of problems, is quite often too busy or unwilling to take the time correctly to analyze and design drainage structures. All too often, it is easier to look in a crystal ball and make a snap decision. With rising costs and increased traffic, the days of adding another span just for good measure or arbitrarily replacing old culverts with the next size larger is both wasteful and short-sighted.

Fortunately, design engineers in State Highway Departments and in private industry have developed many standard designs for small drainage structures which are readily available either as prefabricated or ready-to-install structures. Most of them are widely adaptable and economically feasible under the right circumstances. Some are especially suited to installation on county roads by semi-skilled or common labor.

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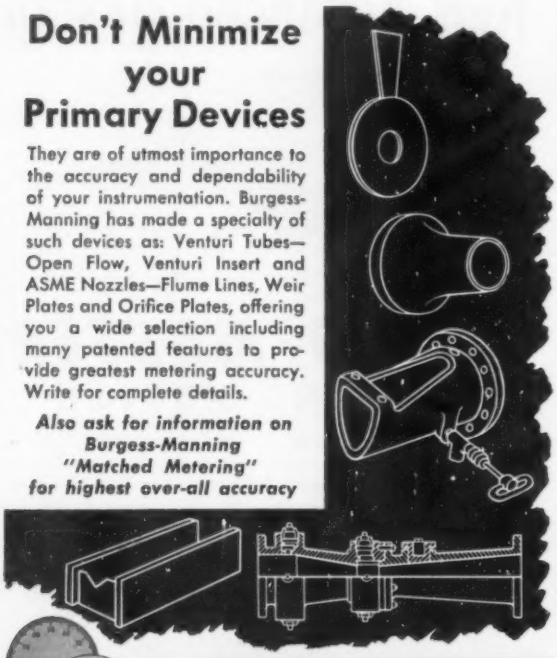

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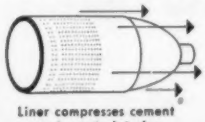

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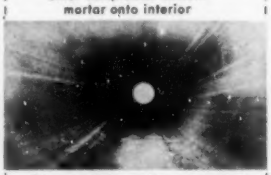

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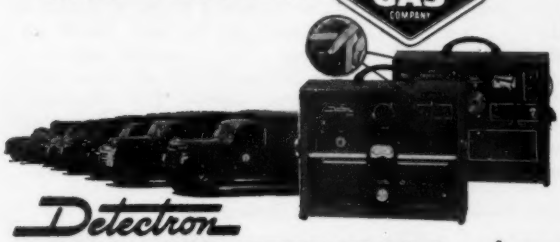

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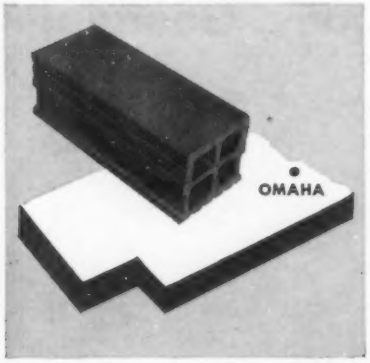

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Water Use Data

(*Continued from page* 109)

bathhouses, 10 gals. Motels per bed space, 40 gals. Drive-in theaters per car space 5 gals.; movie theaters per auditorium seat, 5 gals. Airports, 3 to 5 gals. per passenger. Self-service laundries, 50 gals. of wash per customer. Stores 400 gals. per toilet room, service stations 10 gals. per vehicle served.

Z. N. Dewey, City Engineer of Norfolk, Nebr., in response to a request from T. A. Filipi, Director of the State Division of Sanitation, furnished the following data: "Ye Olde Tavern serves in the neighborhood of 190,000 to 200,000 meals per year. They serve no breakfasts; 40 percent of the meals are noon lunches; the rest are dinners. There is also a bar in connection with the restaurant. The water consumption averages 170,000 cu. ft. per year or nearly 6 1/3 gals. per customer. Of this, a very large percent is from the rest rooms, but we have no figures on this. About as much water is used for air conditioning—last year 175,000 cu. ft. No water is used for landscaping. Total work and customer space is 7,790 sq. ft. We have no data on sewage strength, but there has been some trouble with grease."

• • •

The McDonald Process

(*Continued from page* 113)

taken at regular intervals during operation from key sampling points. Table 1 provides data from a series of 24-hour runs made on the Rockford pilot unit.

Some explanation should be made of the above figures. By determining the solids and water in the solvent discharge from the centrifuge, and reporting the results as percent solids based on the water present, a direct picture of the centrifuge performance is obtained. The influent of raw sludge contained 4 percent total solids while the discharge from the centrifuge contained 12 percent total solids. Thus we removed about two-thirds of the water by centrifuging. The extraction data were obtained by using C_2C1_4 as the solvent. This results in a slightly higher figure than with chloroform or ether.

Because of the importance of the by-products to the economics of the process, a good deal of time was spent in studying these materials. The following are the more significant of the results in the fertilizer analysis in percentages: Nitrogen 2.7; potash 0.1; phosphorous 2.4; humus 48.0; crude fiber 20.6. In addition percentages of the following metals were found in the meal: Aluminum 0.56; calcium 2.7; copper 0.09; iron 2.6; magnesium 0.45; manganese 0.02; nickel 0.04; lead 0.075; silicon 6.6; tin 0.01; strontium 0.02; zinc 0.90; cadmium 0.49; titanium 0.07; barium 0.05; cobalt 0.01.

The Department of Horticulture of the University of Illinois conducted a series of tests on the meal in which rooted cuttings of coleus, a typical soft growing plant, were potted in four soil mixtures. It was found that the sewage meal gave satisfactory results in amounts up to two parts in six. No other fertilizer was added.

The Rockford Board of Health determined the bacteria count on a number of meal samples and the results indicated that the material can be called sterile. The presence of vitamin B-12 in the meal was confirmed by the Wisconsin Alumni Re-

Table 1 — Results of Plant Operation

	Minimum	*Maximum*	*Average*
INFLUENT			
Percent total solids	3.02	5.38	4
Percent grease in dry solids	31.5	36.2	32.9
5 day BOD, ppm	15,000	25,000	22,000
CENTRIFUGE DISCHARGE			
Solvent discharge:			
Percent solids based on H_2O	10.7	18.8	12.6
Aqueous discharge:			
Percent total solids	0.24	0.4	0.33
Percent grease in dry solids	9.1	15.5	11.3
5 day BOD, ppm	1480	2840	2110
Parts of solvent by volume	1 in 5000	1 in 1250	1 in 1580
WATER REMOVED BY DISTILLATION			
5 day BOD, ppm	250	325	300
Parts of solvent by volume	1 in 5000	1 in 5000	1 in 5000
PERCENT REMOVAL OF SOLIDS			93.8
PERCENT REMOVAL OF FAT			97.0
PERCENT REDUCTION IN BOD			90.6

search Foundation. Their determinations found a vitamin B-12 value of 0.3 microgram per gram. With the above results in mind, consideration has been given toward the use of the meal as a feed or, more likely, a feed supplement. However, it must be recognized that only a small percentage of this meal has any nutritive value and the advantages gained from the B-12 and protein would probably be offset by the undesirable remainder.

Table 2—Cost of Sludge Disposal

Item	*Cost Per Dry Ton*
Depreciation & Interest	$7.76
Labor	13 10
Fuel	10.00
Electric Power	2.42
Solvent Replacement	1.27
Filter Powder	1.39
Water	0.66
Total	$36.59

The black fat analysis was: Spec. gravity 60/60 F, 0.984; lb. per gal. 60 F, 8.195; API, 12.3; percent saponifiable, 54.8; % FFA, 29.3; F.A.C. color, darker than 45.

The fuel oil analysis of black fat was: Corrosion, copper strip, 3 @ 212 F; Btu per lb., 15,935; pour point, + 60 F; cold point, + 55 F; sulfur content, bond method, 0.45 percent by wt.; viscosity index, 205.1; visco. 130 F. kin., 101.5 csks.; 130 F SSU., 532 sec.; water by distillation, 1.8 percent by vol.; sediment by extraction, 0.01 percent by wt.; solvent, halide detector, negative.

The analyses indicate that the black fat would be suitable for fuel. Its Btu content is high and its viscosity acceptable. In an area such as Rockford where a large amount of grease is found in the sewage this would offset a major portion of the fuel cost of this method.

An analysis of the meal or dried, extracted solids was also made. At the time of discharge from the plant, the moisture in the samples averaged about 20 percent and the remaining grease about 3 percent.

Costs and Comparisons

About two years was spent in development work, mostly in the solution of problems involving individual components of the plant. Eventually enough running time and data were accumulated so that the steps in the process were believed to be technically complete. No attempt was made to develop the equipment into a smoothly operating commercial unit; the final step was

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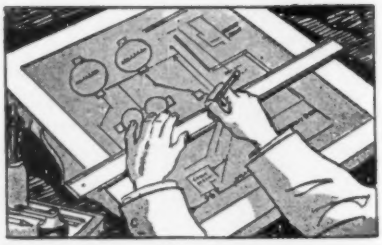

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the operation of all of the components of the plant simultaneously and continuously for several periods of 24 hours each. Satisfactory materials were produced by the plant during these runs and complete data taken so that actual operational expenses could be checked. The results indicated that, should the process prove to be economically sound, it could be developed into a commercial unit. Consequently the next step was to build the experimental data into a complete cost estimate for comparison with the standard costs of treatment, and to investigate the products to evaluate their potential economic contribution.

The Rockford Sanitary District processes about 18,000 pounds of dry solid material each day. The cost of the solvent extraction process was based on a plant that would handle that amount of material. The experimental plant in Rockford was designed to handle only one-third of the full load. Actually it was planned to use three plants of the same size rather than to build one large plant. In this way several standard sizes could be made to cover the market rather than to engineer each job separately. The cost of the three units was estimated, and the yearly depreciation and interest was calculated per ton of dry product. The amount of labor that would be needed to operate the plants were also estimated and reduced to the same common base.

The individual items of cost for the sludge disposal operation in Rockford were as shown in Table 2. Against this cost of treatment must be balanced the possible return that can be expected. Since the products of the solvent extraction process were relatively new, it was necessary to do a good deal of investigating in order to obtain some idea of the potential market value. The results of this investigation were rather discouraging. The best source of income that was unearthed for the black fat was to furnish the steam for the process. The calorific value of the fat removed from the sludge on the Rockford job very nearly equalled the heat requirement of the process. At the present market price of the very low grade of fat that the product was found to be, this was by far the best outlet.

The possibilities for marketing the meal appear slightly more promising. Potentially this is a low grade fertilizer, but it could be used as a base for higher grade fertilizers. However the trend is in the direction of higher and higher analysis fertilizers to reduce shipping and handling costs. Few of the fertilizing

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manufacturers today use any inert filler. The value of the meal as a fertilizer is determined from the nitrogen, phosphorus, and potassium content. Since these are relatively low, the material is worth only $5 to $10 per ton.

Due to the numerous trace elements contained in the meal, it is natural to investigate the value of these. It is apparent upon examination that the use of the material as a source of these elements is a rather haphazard method of supplying the one or two elements which might be deficient in any one area.

The meal also contains a relatively large amount of Vitamin B-12. This suggests a potential outlet as an animal food. The fact that the product is sterile enhances this possibility, but the vitamin can be obtained more economically elsewhere and there are other disadvantages to the use of the meal for this purpose. A large part of the dehydrated sewage sludge is in the form of cellulose which cannot be used by either poultry or swine.

Other avenues of utilization have also been explored for the dehydrated sewage sludge. None has thus far offered an attractive prospect. In view of this discouraging outlook for economic return from either the dehydrated sewage sludge or the black fat, the economic possibilities do not present an encouraging picture. It will be remembered that the overall cost was about $36.59 per dry ton of product. The difference between this cost and that of the conventional methods of treatment must be borne by the sale of the products if the process is to be at least as economical as the present methods.

A survey of the conventional methods of treatment with emphasis on the cost of sludge disposal was made. It was difficult to obtain a detailed breakdown of sludge disposal costs from plant operations. Most of the operators are more interested in the overall cost of treatment than in the cost of any single phase of the operation. However, it was concluded that the cost of sludge disposal probably falls in the range of $15 per dry ton of solids in a city of the size of Rockford. This figure might decrease to $10 per ton in larger cities and increase to about $22 in smaller plants.

The following conclusions were drawn regarding the relationship of the solvent extraction process as compared to conventional methods.

(1) The cost per unit of dry products will be appreciably higher using the solvent extraction process.

(2) Neither product of the sol-

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vent extraction process exhibits enough promise as a source of revenue to warrant confidence that the difference in the cost of operation between the two processes can be overcome.

(3) Until conditions in the fat market or in the value of returning organic material to the soil improve, or until unforeseen uses for either material are developed, it would be difficult to justify the selection of the solvent extraction process over conventional methods.

(4) Until there is some justification for the selection of the solvent process, there would be no point in the further development of the process into a smooth commercial operation.

What Was Accomplished

In spite of the discouraging economic outlook for this type of treatment, it is felt that there have been some worthwhile accomplishments. First, the plant was operated over a long enough period to establish that the process is a workable one with sewage sludge. The expected by-products were obtained and treatment was complete in that the meal and fat were sterile. There still remains the possibility that more profitable uses for the by-products will be found which would change the economic outlook of the process.

Probably of more significance is the success obtained in the centrifuging of sludge. Earlier attempts at removing water from sewage sludge by this method were unsuccessful in that the resulting effluent was still very high in solids. It should be noted that the aqueous discharge from this centrifuge averaged only 0.33 percent in total solids, and that the total effluent from the plant was made up of two parts of this discharge to one of the water removed by distillation. When the volume of effluent is considered and converted to population equivalent, it seems entirely feasible to put this entire flow in with the effluent from the primary clarifiers for secondary treatment. It should also be mentioned that the centrifuging cannot be accomplished without the premixing of solvent, and, for this reason, cannot be operated for sludge dewatering alone.

The authors gratefully acknowledge the help of Paul H. Carlson, of the Rockford Sanitary District, and C. W. Anderson of the Rockford Board of Health who aided in the laboratory testing. We are also indebted to Henry A. Riedesel of Rockford for his help in obtaining comparative cost data used in this article.

PUBLIC WORKS EQUIPMENT NEWS

Highway Sign For Road Conditions and Directions

Message changes to fit road condition

Sign can be seen for 1500 ft. at night

A new highway sign has been announced by Tele-Dynamics Inc. The highway weather-directional sign may be mounted either overhead or on pedestals along roadways, bridges and traffic tunnels. High visibility is assured by bold, clear letters in daylight and by illumination at night. The lettering is readable at 1500 feet day or night using Series "E" type letters fabricated from white plexiglas or other standard colors, such as red, green or amber. Standard units are built in individual sections (3 faces) for assembly either vertically or horizontally. Each unit is 141 inches long, 24 inches high and 22 inches deep. Other sizes are built for special applications. The messages can be changed easily by remote control, using wires; remote control, using radio; and local control, at the sign. For further information on this weather-directional sign write Tele-Dynamics Inc., 32nd and Walnut Sts., Philadelphia 4, Pa., or circle **No. 3-1** on the reply card.

Transport for Hauling Refuse

A refuse transport body that loads directly from trucks or clam shells, and unloads in about 5 minutes, has been announced by the Baughman Mfg. Co. The transport body is available in lengths up to 40 feet, with an approximate capacity of 85 cu. ft. per lineal foot of a body measuring 93 inches high and 95 inches wide. Three methods of unloading may be used: The tractor hooks onto winch line, is driven away from body to discharge material, and a convenient hand crank rewinds line onto a drum; a truck-mounted winch system operates the entire unloading mechanism; operates from auxiliary motor or PTO, the system operating an endless chain and link conveyor for unloading. For additional information, write to the Baughman Mfg. Co., Jerseyville, Ill., or check **No. 3-2.**

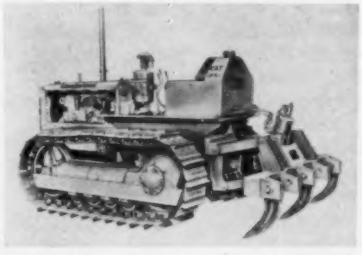
Body has capacity of about 85 cu. ft.

Chemical Snow and Ice Remover

Ice and snow remover in pellet form for industrial and commercial use has been introduced by Tropical Paint Company for factory driveways, roads, walks, parking lots, and loading docks and steps. It is effective for melting ice to —30°F. The pellets react quickly, penetrating the ice and do not roll off a grade. The ice remover may be used also for keeping catch basins, gutters and other hard-to-get-at places free of ice. The pellets react chemically with the water in ice and snow to produce heat. So quickly does this compound go to work that truck drivers can carry a supply for use under wheels spinning on ice or snow and find it more effective than chipping ice or digging. Ice remover can be safely applied to good concrete and will not damage asphalt surfaces. Dormant grass and shrubs are unaffected by it. For complete information write the Tropical Paint Co., Cleveland 2, Ohio, or check **No. 3-3** on the card.

Ripper with Replaceable Teeth

A new ripper for use with the Caterpillar 60-inch gauge D4 Tractor has been announced. This No. 4 ripper is designed for tractors having grouser widths up to 18 inches. The new tool is equipped with three teeth having replaceable tips. This feature provides the user a choice of the number of teeth to be used; when used to rip to the edge of walls or banks, the teeth may be inserted backwards and ripping performed while backing up. When working in hard material, the ripper has available the full power of the machine to be absorbed by one tooth at maximum penetration without damage. Parallel linkage maintains a uniform ripping angle at all penetration depths, producing maximum ripping action. With the ripper mechanism fully retracted, the length of the D4 Tractor is extended only 28½ inches, providing maneuverability in confined areas and enough ground clearance to allow climbing a 30 deg. incline. Maximum ground penetration is 12 inches; ripping width to 71 inches; and ground clearance 15¼ ins. The No. 4 ripper is also adaptable to Caterpillar No. 955 Traxcavators. For more information, write to Caterpillar Tractor Co., Peoria, Ill., or circle **No. 3-4** on the reply card.



Ripper is designed for use with Cat D4

Loader and backhoe units on a Minneapolis-Moline tractor

Saw can be used in water main, sewer and road construction

Ottawa Backhoe and Loader

The Ottawa industrial backhoe and front end loader have been approved by the Minneapolis-Moline Co. for mounting on their new model 445 industrial tractor. Ottawa's patented "One-Trol" (single operating lever) controls all the actions of the front end loader, and dual One-Trols on the backhoe permit the operator to coordinate all movements of the bucket, stick and boom, without multiple levers. The backhoe is available in two models, one to dig 11 ft., the other 8½ ft., and can be equipped with buckets from 12 to 36 inches in width. An automatic ejector bucket is an exclusive feature of the Ottawa backhoe. A clamshell bucket with twin double-acting cylinders, which can be operated individually or simultaneously, is also available for the backhoe. Either side of the clam can be opened to use the other side as a regular bucket. The clamshell bucket is especially useful for removing rubble from concrete patchwork. Double acting cylinders are used to actuate the loader bucket and double acting piston type cylinders are used interchangeably on both loader and backhoe. For more information write to Ottawa Steel Division, L. A. Young Spring & Wire Corp., Ottawa, Kansas, or check **No. 3-5** on the reply card.

Abrasive Masonry Blade

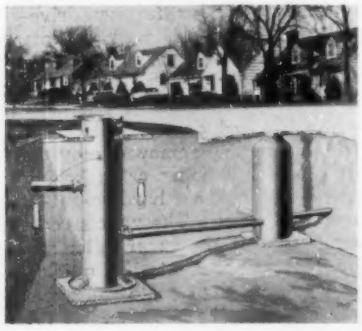
A new method of abrasive masonry blade manufacturing is used by Champion Mfg. Co. in the production of E-Z Cut blades. Sintered silicon carbide crystals are sealed between two layers of parchment to assure maintenance of blade specifications, resulting in a blade that provides easier cutting with less chipping. For more information write Champion Mfg. Co., 2028 Washington Avenue, St. Louis, Mo., or check **No. 3-6** on the reply card.

Lightweight Gasoline Powered Saw

Versatility and safety are features of the new gasoline powered saw which utilizes a reciprocating blade that works like a handsaw. A safety blade guard protects the operator and guides the blade. This tool may be used for cutting pile supports and sheathing, trimming, bucking, undercutting, precision cutting and heavy duty work. It cuts through wood at a speed of 173 strokes per second and will cut from any position. For ease of maintenance, the blade can be changed in 30 seconds and sharpened in less than 10 minutes on the job. Another time saver is the automatic rewind starter which starts easily at all temperatures. Among its safety features is a safety cut-off switch with one-finger control. Because of its light weight vibrationless action, operator fatigue is reduced, and the short stroke makes felling safer. For full details write Dept. PW, The Wright Saw Division, **Thomas Industries Inc.**, Louisville 2, Ky., or circle **No. 3-7** on the reply card.

Duplex Sewage Ejector Station

A duplex pneumatic sewage ejector lift station, the "Du-O-Ject" has been announced by Smith & Loveless. This is an adaptation to dual operation of the low-cost "Mon-O-Ject" single pneumatic sewage ejector lift station, used widely in factories, schools, motels and subdivisions. The basic advantage of this new duplex unit is faster, continuous pumping action, with two sewage receivers, integrated into one factory-built assembly, receiving and ejecting alternately. For easy servicing, either side can be shut off separately, without complete interruption of operation. This new duplex pneumatic sewage ejector lift station fills a need among municipalities and real estate developers, for relatively small sewage flows of from 30 to 200 gpm. For more information, write Smith & Loveless, Inc., P.O. Box 8172, Kansas City, Mo., or check **No. 3-8** on the reply card.



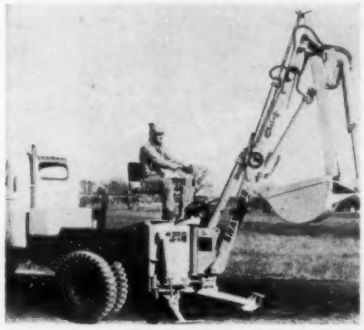
Compound Steam-Air Pile Hammer

Low total weight to ram weight ratio, which offers the advantages of low steam or air requirements and a smaller, and less costly crane, is a feature of the McKiernan-Terry C-5 compound pile hammer. Although the C-5 delivers 110 blows per minute with a striking energy of 16,000 ft-lbs. it has low striking velocity which results in little pile head deformation. The hammer is designed to protect itself against damage should the pile slip away from the hammer; it is self-stopping when no support exists under the anvil block and will automatically go back into operation when support is re-established. Other design features include a one-piece cylindrical ram, no mechanical ram-to-valve connections, and externally removable valve-system subassemblies. Write to McKiernan-Terry Corp., Pile Hammer Div., Dover, N. J., or check **No. 3-9** on the reply card.

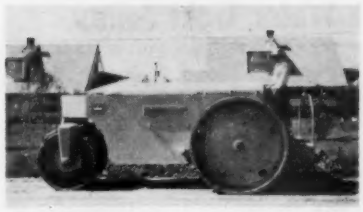
Painting a Surface with Two or More Colors at Once

Used on nearly all of the structures of the Kansas Turnpike, Zolatone is a painting system which permits spraying on two or more colors simultaneously in a single spray coat. No special equipment is required for this and it can be applied to practically any surface—wood, brick, cinder block, glass, plywood, tile and metal. When red Zolatone is poured into white, the result is not pink, but each portion retains its original color. There is no limit on the number of multi-color blends in which all of the individual colors can be seen, intermixed among each other in whatever ratio has been established. Zolatone is said to offer a high degree of protection against weather or corrosion. More information from Paramount Paint & Lacquer Co., Los Angeles, Calif., or circle **No. 3-10** on the card.

Truckmounted Heavy-Duty Backhoe



To provide a digging unit possessing ability to operate in rough terrain, a truck mounted digging unit has been made available by Shawnee. The trucks, heavy duty with 4-wheel drive, are renovated standard models with a power takeoff at the transmission for driving the hydraulic system of the backhoe. Standard mounting on the truck frame is adaptable to either the Shawnee "Chief" or the Shawnee "Warrior" backhoes. The "Chief" digs approximately 15 ft. deep and the "Warrior" 12 ft. deep. Both backhoes have hydraulic cylinders operating synchronously but in reverse directions on either side of the axis pin. Also, both models operate in three 120° quadrants which are changeable by the operator without leaving his position at the controls. For additional information write the Shawnee Mfg. Co., 1947 North Topeka Avenue, Topeka, Kans., or check **No. 3-11** on the reply card.



Rollers offered in five basic models

3-Wheel Roller Line with Torque Converter and 2-Speed Transmission

A new line of 3-wheel rollers with torque converter and two-speed transmission has been announced by Huber-Warco. Five basic models are offered for all general purpose, finishing and variable-weight compression jobs. The 10, 12, and 14-ton models can be supplied with either standard-sized cast rolls for general purpose compaction or wider cast rolls for finishing work. For variable compression, the 10-12 and 12-14 ton models are available with fabricated, watertight rolls. A tail shaft governor teams up with the torque converter and two-speed transmission for ease of operation and, within close limits, it automatically maintains the rolling speed set by the operator, regardless of grade. Removable tire design is incorporated in all standard weight models; tires of all rolls can be removed by unbolting them from the wheel and hub, without replacing an entire roll. All tires and wheels are interchangeable because they vary in thickness and weight—not circumference. Precision alinement of the guide roll assembly can be maintained for the life of the roller. For details write Huber-Warco Co., Marion, Ohio, or check **No. 3-12** on the reply card.

Digger for Setting Posts for Guard Rails

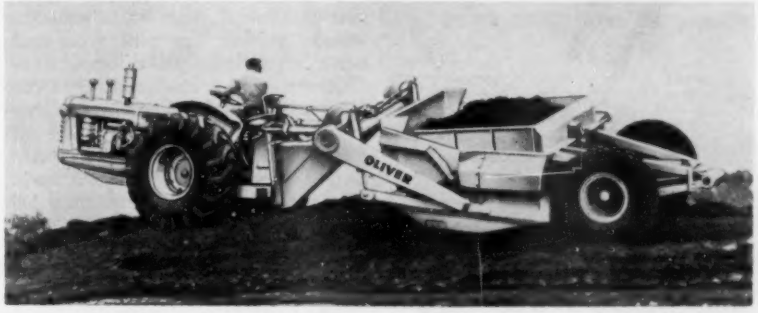
A heavy-duty highway digger, announced by the Roper Manufacturing Co., digs to the 48-in. required depth for setting post and guard rails, with augers available to 14 inches in diameter. It is easily mounted on tractors generally used

Post hole diggers are easily mounted on most makes of industrial tractors

for mowing brush and weeds along highways. Standard equipment includes a slip-clutch universal joint, ⅜-in. spiral flighting with hardened long-wear edges, and a hardened "fish-tail" point for fast penetration. For more details write Roper Mfg. Co., Zanesville, Ohio, or circle **No. 3-13** on the reply card.

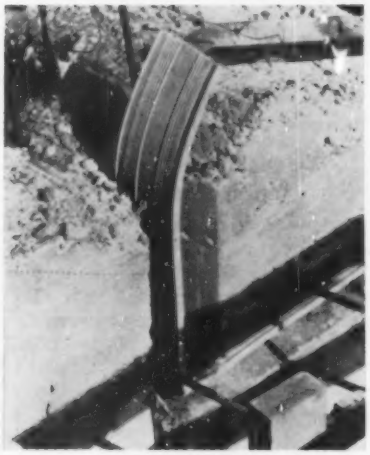
Scraper Combines Speed and Maneuverability

An entirely new scraper, the Oliver 990, in production by the Oliver Corporation, is a flexible multi-job rig of a 6.7-cu.yd. capacity, designed to extend the range of scraper applications. Because of its maneuverability and small size (8½-ft. width) it can be used in congested city areas and other confined places. Power is furnished by a 3-cylinder GM diesel of 77.4 drawbar horsepower with 6-speed transmission. Torque onverter is also available as optional equipment. The scraper has all-hydraulic design including hydraulic pressure ejection. For complete information write to The Oliver Corp., Industrial Division, 400 West Madison St., Chicago 6, Ill., or check **No. 3-14.**



Scraper has a 6.7 cu. yd. capacity and is a multi-job rig used in road construction

Bakelite Water Stops For Water Tight Joints



Variety of ridge patterns are offered

Coils of Bakelite are easy to handle

Sections of a concrete sewer tunnel for the Seaway project at St. Lambert, Quebec, have long ridged ribbons of Bakelite vinyl resins as waterstops embedded at the joints between sections. The waterstops can stretch or contract to keep the tunnel watertight as the joints open and close with temperature variations; and are resistant to the acids and alkalies in the concrete. Ridges are formed on both sides of the diaphragm-like ribbon to give the waterstop a grip on the concrete. The tensile strength of not less than 1,900 pounds psi as well as the elastomeric properties, enable it to withstand movements of masses of concrete without being sheared. Fifty-foot coils of the flexible waterstop are easy to handle; splicing is a simple matter of heating the ends to be joined and holding them together until they form a bond. These waterstops are available in a variety of ridge patterns and in widths from three-quarter inches to nine inches. For more information, write Electrovert Inc., 489 Fifth Avenue, New York 17, N.Y., or check **No. 3-15** on the reply card.

Front End Loader for 4-Wheel Tractors

A new line of tractor-mounted front end loaders is announced by Superior Equipment Division. The bucket rams are mounted so that they cannot "spring" and hydraulic piping is inclosed in loader arms for protection. The loaders have strong "pry-out" action for heavy or frozen loads, and can be mounted on most models of low four-wheel industrial tractors. National, Canadian and export distribution is now being established. For further information write Superior Equipment Division, P. O. Box 341, Wheeling, Ill., or check **No. 3-16** on the reply card.

Superior loaders have the strong "pry-out" action for heavy or frozen loads

Multiwheel Compactors

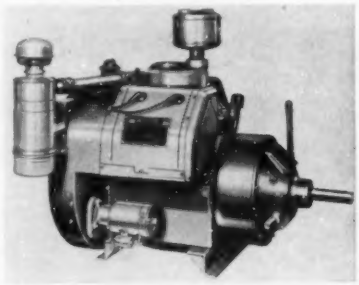
A complete new line of multiwheel pneumatic compactors has been added to the Chester compaction equipment. The No. 13W80 (13 wheel) rubber tire pull type unit has a large capacity and low center-of-gravity; and the body can be filled with suitable ballast available on the job. Oscillating action of pair-mounted wheels distributes weight evenly and provides kneading action. Rolling width is 95 inches; body capacity 115 cubic feet; load per tire 2000 lbs. For full details write Chester Products Co., Hamilton, Ohio, or circle **No. 3-17** on the reply card.

Fabric For Concrete Curing

The Herculite combination of nylon and special plastic is now being used for such purposes as concrete curing, tarpaulins and equipment covers. Combining high strength with low weight and weather resistance the fabric does not support combustion. In addition it is 100 percent waterproof, will not rot or mildew and is resistant to acids, grease and oils. Complete information about Herculite from Herculite Protective Fabrics, Inc., 140 Little Street, Belleville, N.J., or circle **No. 3-18** on the reply card.

Heavy Duty Air-Cooled Engines

Two new 4-cylinder "Vee" engines—the Models VH4 and VR4D are announced by Wisconsin Motor. The VR4D is capable of producing 60 hp and has extremely high torque characteristics, making it ideally suited to powering both road and general construction machinery. A hydraulic pump accessory drive is a feature with the 4-cylinder models. For more information on these air-cooled engines write Wisconsin Motor Corp., Milwaukee 46, Wisc., or circle **No. 3-19** on the reply card.



Medium Duty Tractors

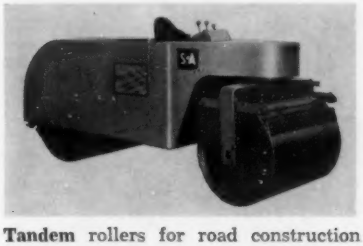
The new Work Bull line, now being produced by Massey-Harris-Ferguson, consists of a choice of five tractors with attachments including loaders, back-hoes, blades, fork lifts, utility brooms, mowers, sweepers, augers and more than a dozen other attachments for construction, maintenance and materials handling. These units are expected to plug a gap between light and heavy duty equipment. Designed for jobs from the work-and-run variety to small cleanup work, these units will find extensive use performing work which formerly tied up larger equipment, as on highways, parks, golf courses, nurseries, cemeteries, and for all-around job use. For further information, write to Massey-Harris-Ferguson, Inc., Quality Ave., Racine, Wis., or check **No. 3-20** on the reply card.

Transistorized Flashers

A transistorized flasher is available from Dietz in four models: 360 degree barricade, two-faced barricade, 360 degree traffic cone, and two-faced traffic cone type. Chief advantages of transistors over vacuum tubes are their long life, ruggedness, and requirements of only 1/1000th the power and a small fraction of the space of a vacuum tube. Another feature—important for safety—is that transistors do not grow progressively weaker. The flashing rate can be regulated, normally it is 60 to 70 times per minute. The two barricade type models operate at 6 volts, using either one or two standard electric lantern batteries, and have a keyed lock and switch combination to prevent tampering. The light can be turned in any direction by means of its swivel base. Batteries in these models have a life of at least 1200 hours. In traffic cone models five standard "D" cell flashlight batteries are used with battery life exceeding 750 hours. The two-faced models cover a 90 degree field at both front and back, and also provide flashing light to both sides for added safety. Yellow lenses are used in all four models. More from Electronic Flasher Division, R. E. Dietz Co., 225 Wilkinson Street, Syracuse, N. Y., or by checking **No. 3-21** on the reply card.

Seaman-Andwall Rollers

Two new designs in tandem steel rollers have been announced by Seaman-Andwall. The models, rated at 5 to 8 and 8 to 12 tons respectively, have several engineered features that are said to insure ease of operation and control flexibility. A specially-designed transmission on each unit permits three speeds in both forward and reverse movement—and these speeds are controlled by a single lever. No shifting or clutching is required. Hydraulic power steering permits smooth, effortless handling. Provision for water ballast in both front and rear rollers offers wide variation in weight adjustment to fit specific needs. Gasoline engines are standard, rated 65 and 73 hp., with diesel available on special order. For more information write Seaman-Andwall Corp., Milwaukee 1, Wisc., or circle **No. 3-22** on the reply card.



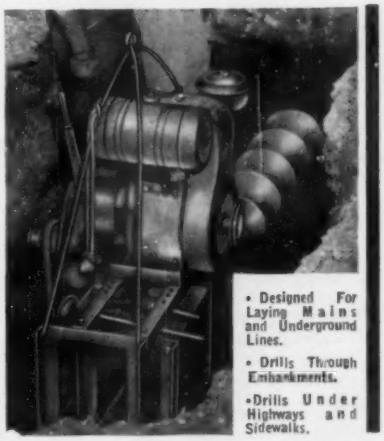
Tandem rollers for road construction

Soil Compaction Testing Machine

A mechanical soil compactor offered by Soiltest eliminates the tedious hand compaction test process and produces uniform results with a considerable saving of time. The compactor is easily adaptable for the interchange of the standard 5.5-lb. (12-in. drop) and modified 10-lb. (18-in. drop) hammers for performing tests in accordance with AASHO and ASTM specifications. Powered by an electric gear transmission drive, the drop hammers are automatically lifted and dropped from exact required heights. A counter registers the number of blows per compaction layer and the mechanism can be preset to stop at a specified number of blows. With floor space requirements 15 by 15 ins., the compactor is entirely self contained and needs only a plug-in to an electrical outlet for operation. For details, write Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill., or check **No. 3-23** on the reply card.

Unit for testing soils in embankments

CUT DIGGING TIME and COSTS with the LOW COST PREWITT HORIZONTAL DIGGER



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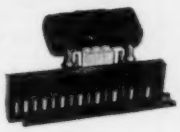

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Junior Engineer (Civil, Mechanical, Electrical) ..... $460—$530
Assistant Engineer I (Civil, Mechanical, Electrical) .. $500—$600
Assistant Engineer II (Mechanical) ..... $590—$680

For Further Information and Applications, inquire:

San Francisco Civil Service Commission
154 City Hall
San Francisco, California

VILLAGE ENGINEER

For progressive Northeastern Ohio Village of approximately 5,000 population. Will have charge of design, construction and maintenance of street, water and sewer improvements. Must be eligible for Ohio registration. Salary $6,100.00 with future merit increases.

Submit application to

C. E. Rhonemus
City Hall
Rittman, Ohio

VALUABLE INFORMATION FOR ENGINEERS

Thousands of progressive engineers are finding that our readers' service section is the easy, handy way to obtain new catalogs of advertised products. Be sure and return the postage free reply card opposite page 70.

SEE PAGES 42 TO 62

WATER AND SEWER ENGINEERS DESIGN—CONSTRUCTION—OPERATION MANAGEMENT

The Philadelphia Water Department is seeking engineers with ability and experience in all phases of work in the operation of a large scale modern water and sewer utility.

You will have opportunity to work on large scale projects and creatively participate in new developments and advanced techniques of operation and management.

We offer full professional recognition and the personal benefits of an important position with a major metropolitan utility.

Mail this ad with your name, address, and area of interest or write directly to

SAMUEL S. BAXTER,
CHIEF ENGINEER
PHILADELPHIA WATER DEPARTMENT,
CITY HALL ANNEX,
PHILADELPHIA, PA.

MALE HELP WANTED

Assistant to Howard County Engineer. Construction, Maintenance and some Engineering experience in supervisory capacity. Salary open.

Send resume to:

COUNTY ENGINEER
Big Spring, Texas

CITY ENGINEER

Registration desired or approaching registration. Work consist of both field and office work covering sewage and sewer system. Water, streets and building. Apply to:

L. A. Hanson
City Manager
City Hall
Cadillac, Michigan

ENGINEER WANTED

Young graduate Civil Engineer or equivalent experience to assist Director of Public Works, village of 30,000. Salary Plan $5904 to $6840. Write to:

Director of Personnel
125 South 5th Avenue
Village of Maywood
Maywood, Illinois

BUILDING INSPECTOR

Pottstown, Pa. (Pop. 29,000)—Training and/or experience required. Salary open. Submit resume to:

Borough Manager
Borough Hall
Pottstown, Penn.

WATER WORKS OPERATOR

Pottstown, Pa. (Population 29,000)—5 MGD Plant. Training and/or experience required. Salary open. Submit resume to:

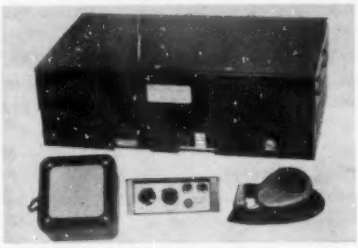
Borough Manager
Borough Hall
Pottstown, Penn.

CITY ENGINEER

A City Engineer is wanted. **Must have Iowa license.** Write or contact, **stating qualifications, experience and salary desired to:**

City Council
Box 186 **Clear Lake, Iowa**

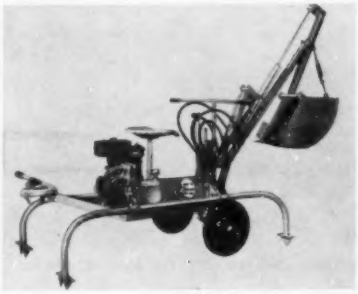
Mobile Radiotelephone Designed for Field Work



A new mobile AM radiotelephone, designed to provide reliable long distance communications under adverse terrain conditions, is the newest item in Kaar Engineering's line of communications equipment. Designated the TR 245, this 50 watt 2-way unit was specifically developed to handle field communications in maintenance and construction work, geological surveys and governmental agencies. Easily installed in cars, trucks, jeeps or other vehicles, the unit has a frequency range of 1.6 — 8 Mc. The 245 features strip chassis construction for easy maintenance, optional dual channel operation, and 6 or 12 volt operation without modification. For further information contact Kaar Engineering Corp., Box 1320, Palo Alto, Calif., or circle **No. 3-24.**

Portable Backhoe

For digging to a depth of 5 ft. for trenches, bell holes and excavations a portable, powered backhoe is announced by The Charles Machine Works Inc. The Ditch-Witch backhoe is a trailer unit and may be towed behind a car at normal road speeds; it weighs 500 pounds and has its own complete gasoline power unit and hydraulic system. The backhoe is well suited to digging in soils where gravel and loose rock are prevalent, for sewer and service lines, for maintenance and connections on pipe lines and mains, for septic tank installations and for footings and foundations. Write the Charles Machine Works, Inc., Perry, Okla., or check **No. 3-25.**



Fast Cutting Hammer Bits

A tungsten carbide tipped hammer bit in sizes 3/16-in. through 1½-in. diameter has been developed by Tilden Tool Mfg. Co. These bits are of the solid chisel point type through ⅝ inches, and core type with patented core slot in the larger sizes, with multiple carbide cutters. The advantage of the core type hammer bit is that it drills only the perimeter of the hole, thereby appreciably increasing the capacity of the hammer and drilling speed in hard masonry or rock. These bits will operate successfully in self rotating air or electric hammers as well as standard hammers employing turning chucks. Removable extension shanks and extra length bits are available for sizes 1⅛-in. through 1½-in. For information, write to Tilden Tool Mfg. Co., 209 Los Molinos, San Clemente, Calif., or check **No. 3-26** on the reply card.

A Half-Size Asphalt Paver

This Blaw-Knox black top paver, Model PF-45, is a half-size paver and is designed for paving walkways, driveways, playgrounds and city streets. The rubber tired paver is 14 feet long and its 10-ft. wide hopper has a capacity of 4 tons. A continental F-162 gas engine provides power for six working speeds and a travel speed of approximately 8 mph. Control of the screed, which has a vertical tamping action of 1000 rpm at 1300 engine rpm, is hydraulic. For full data write Blaw-Knox Co., 300 Sixth Ave., Pittsburgh, Pa., or circle **No. 3-27** on the reply card.

Electric Elevating Tailgate For ½ and 1-Ton Trucks

An elevating tailgate that lifts up to 600 pounds in fifteen seconds by simply touching a button has been introduced by Mid West Body. One man can load and unload trucks quickly, without heavy lifting. The motor is reversible and has a built in motor brake, to prevent coasting. The all steel, ramp type unit weighs only 225 pounds, and is designed to save rear end over balance. It provides better weight distribution with larger load capacity, yet permits the vehicle to operate within its present license fee. Delivered completely assembled, the unit installs easily in a few hours. The tailgate is ideal for moving sewer pipe, fire hydrants, valves, cement and other maintenance and construction materials. For more details write Mid West Body Mfg., Paris, Ill., or circle **No. 3-28** on the reply card.

MEETING NOTICES AND PROGRAMS

Industrial Waste Program at NJ SIWA

This is the program prepared by the Industrial Wastes Committee of the New Jersey Sewage & Industrial Wastes Ass'n. for presentation at the March 13 meeting at the Traymore Hotel. The first three papers will be presented at the morning session, following a film presentation; the others in the afternoon.

"Treatment and Disposal of Wastes from the Manufacture of Anthraquinone Dyes" by M. B. Smith, Wastes Supervisor and O. B. Grant, of Toms River-Cincinnati Chem. Corp.; "Development of An Aerobic Biological Process for the Treatment of Board Mill Wastes" by H. Gehm, Tech. Advisor and I. Gellman of National Council for Stream Improvement, Incorp.; "Pollutional Characterization of Synthetic Organic Chemical Wastes", by Bernard Berger, Chief, Water Supply & Pollution Research, Robert A. Taft, San. Eng. Center.

"Presurvey for Plant Site Selection from Standpoint of Waste Treatment", by Louis Roznoy, Wastes Consultant, Celanese Corporation of America; "Effects of Industrial Wastes on Potable Water Supplies and Solutions to Problems", by F. DeHooge, Supt., Purif. & Watershed, Passaic Valley Water Com.; "Effects of Toxic Substances on a Sewage Treatment Plant", by N. S. Chamberlin and E. S. Ordway, Havens and Emerson, Consultants.

Louisiana Water and Sewerage Short Course

The Twentieth Annual Short Course for Superintendents and Operators of Water and Sewage Plants will be held on the campus of Louisiana State University, March 20, 21, and 22, 1957.

South Dakota Water and Sewerage Conference

The Twenty-Third Annual South Dakota Water and Sewage Works Conference has been set for September 11 to 13, 1957. Headquarters for the meeting will be the Sheraton-Cataract Hotel in Sioux Falls, South Dakota.

Florida Municipal and Sanitary Engineering Conference

The tenth Municipal and Sanitary Engineering Conference will be held on the campus of the University of Florida, Gainesville, on March 19 and 20. The general theme will be "The Impact of Industrial Expansion on Man and His Environment."

New England Sewage and Industrial Wastes Association

The spring meeting of the New England S&IWA will be held at the Viking Hotel, Newport, Rhode Island, on June 6. The meeting will be preceded by a dinner on the evening of June 5. Earl R. Howard of Hartford, Conn., is secretary.

Skid-Shovel Helps Remove Chicago Traffic Bottleneck

Courtesy International Harvester Company

● **SCOOPING concrete chunks, formerly a curb that was removed in a traffic improvement project on North Avenue near Chicago. A low landscaped strip will replace old curb. McKay Constr. Co. owns the International Drott TD-9 Skid-Shovel.**

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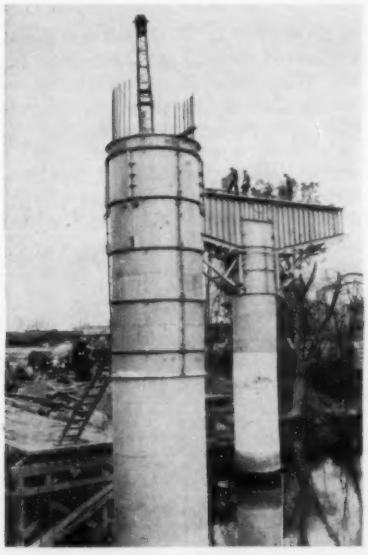
PUBLIC WORKS JOURNAL CORP.
200 So. Broad St., Ridgewood, New Jersey

CONSULTING ENGINEERS APPEAR ON PAGES 212 to 216

Worth Seeing

Starring in the dedication ceremonies of San Jose, California's, new $3½ million sewage treatment plant in November were these three big Enterprise engines that provide power to drive generators that operate pumps, blowers and compressors. 90 percent of their fuel will be gas recovered from the sludge digestion tanks.



Special column and T-head forms by Blaw-Knox require no external guying. This is the foundation for the James River Bridge at Richmond, Virginia.

Further evidence that water departments use "heavy equipment" in greater amounts than many people realize. Here the Billings, Montana, Water Department is pipe-laying with a hydraulic crane truck manufactured by Truck Crane, Inc., recently acquired as a subsidiary by Anthony Company, Streator, Ill.

The new Industrial Engine Plant of Caterpillar Tractor Co. will be constructed on a site twelve miles north of Peoria, Illinois, to provide about 500,000 square feet of space.

Increased annual manufacturing demands of Barber-Greene Co. have resulted in two large plant expansion projects. One, pictured here, is at DeKalb, Ill., one is in Canada.

New Discovery Saves Costly Plumbing Bills

★ CLEANS INSTANTLY

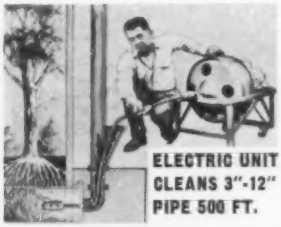
CHICAGO—Feb. 1st—City Buildings, Offices, Sewage Plants including Home Owners are constantly having trouble with clogged-up pipes, which proves expensive in Costly Plumbing Bills—

But now—using Water Impact and Air Pressure, here is a new unit called the **Plumber's Flushing Gun**, which cleans all lines up to 100 ft. It will open any number of bends in pipe. Yet anyone can operate this new gun, which triggers easily.

TOILETS, URINALS, SINKS, and FLOOR DRAINS clogged with paper, grease, rags, sand, and other debris can be cleared with one or more shots from the gun, **saving the owner, the Gun's price the first time it is used.** This new Flushing Gun may be used on any ½ to 6 inch waste pipe including Sink Drains, Floor Drains, Hot Water Pipes, Drinking Fountains, Septic Tanks, and Urinals. Obstructions melt away INSTANTLY when struck by the hammer like blow of this new unit.

This New Flushing Gun is offered on 30 Days Free Trial. BUT MOST IMPORTANT IS THIS—What is this Tool worth in **Costly Plumbing Bills** Saved to your city or building. For your own good—Tear this Ad out now and write your name and address beside Ad for **FREE BOOKLET.** No agent will call—Obey that urge, mail now or write postcard. (Chicago Phone Kildare 5-1702)

MILLER SEWER TOOLS, DEPT. PWR
4640 N. CENTRAL AVE. CHICAGO 30, ILL.



YOURS FREE! CATALOG

Complete literature on all of Miller Sewer Rod Equipment including all types of flat sewer rods, music wire rods, electric and hand units, and **Miller's Triple Action Grease and Root Cutter** which features Patented Self Expanding Blades for 3 to 12 inch Pipe. OBEY THAT URGE AND WRITE to above address. Compare our prices.

by Arthur K. Akers

Mr. Orchard

★ WILLIAM J. ORCHARD was nominated as the treasurer of the American Water Works Association at the annual meeting of its Board of Directors in January. Formerly and until his retirement general manager of Wallace & Tiernan Inc., few national figures ever presented here are in less need of any amplifying remarks on our part than Bill Orchard. His friends, who are legion, will instantly recognize both his picture and his fitness for a post which will continue him high in the councils of the AWWA.

★ DORR-OLIVER Incorporated announces plans for major expansion and re-allocation of its United States production facilities. The program includes centralization of all domestic filter manufacture at the growing Hazleton, Pa., plant.

★ CASE-AMERICAN TRACTOR merger is announced as completed. Marc B. Rojtman, 39-year old former American president becomes executive vice president and general manager of J. I. Case Co. combined and enlarged operations.

★ A new 16 mm sound, color, 20-minute film is available for loan from Millipore Filter Corp., publications department, Watertown 72 Mass. Content: new Millipore Filter Standard method for bacteriological analysis of water.

★ R. J. KREUSSER is new fleet sales manager of Willys Motors, Inc. Jeeps and jeep trucks, to you.

★ GOLDEN-ANDERSON Valve Specialty Co., Pittsburgh, announces re-organization and expansion. New facilities, new lines, and a new management group headed by Grant A. Colton, who will continue as president and general manager with the office of chairman of the board added.

★ TONCAN CULVERT MANUFACTURERS ASSOCIATION elects to its Board of Trustees G. F. Beall, Portland, Oregon; J. M. Wood, Memphis, Tenn.; W. J. Sweeney, Groton, N. Y. Reappointed as Managing Director and ex-officio Board member is our old friend Col. Hubert Synder.

★ PAUL R. RUTHERFORD of Cuyahoga Falls, Ohio, is re-elected President of the Clay Sewer Pipe Association, Columbus, Ohio.

★ ROBERT L. WICKER has been appointed general sales manager for the Wm. Bros Boiler & Manufacturing Co., in charge of all promotion, advertising and sales.

★ DAVID S. HANSEN Jr. has been appointed sales manager in charge of dealer sales by Minneapolis-Moline Co. as part of a major expansion program. He was formerly sales manager, Baker-Lull Corp.

★ JACK E. DAVIS is the new assistant to the president of Seaman-Andwall Corp., Milwaukee.

Mr. Lange

Mr. Davis

★ HARRY M. LANGE has been made manager of the Southern Sales Department of the American Cast Iron Pipe Co., at Birmingham, succeeding Tom M. Starnes who retires after 45 years of service.

★ RALPH G. GREER succeeds the late I. P. Payne as manager of sales, Construction Equipment Division, International Harvester Co.

★ "DO YOU KNOW when you've had enough?" inquired the bartender. "No," replied the customer. "When I've had enough I don't know anything." —*Deco Trefoil*

For Houston's new 50 mgd plant . . .

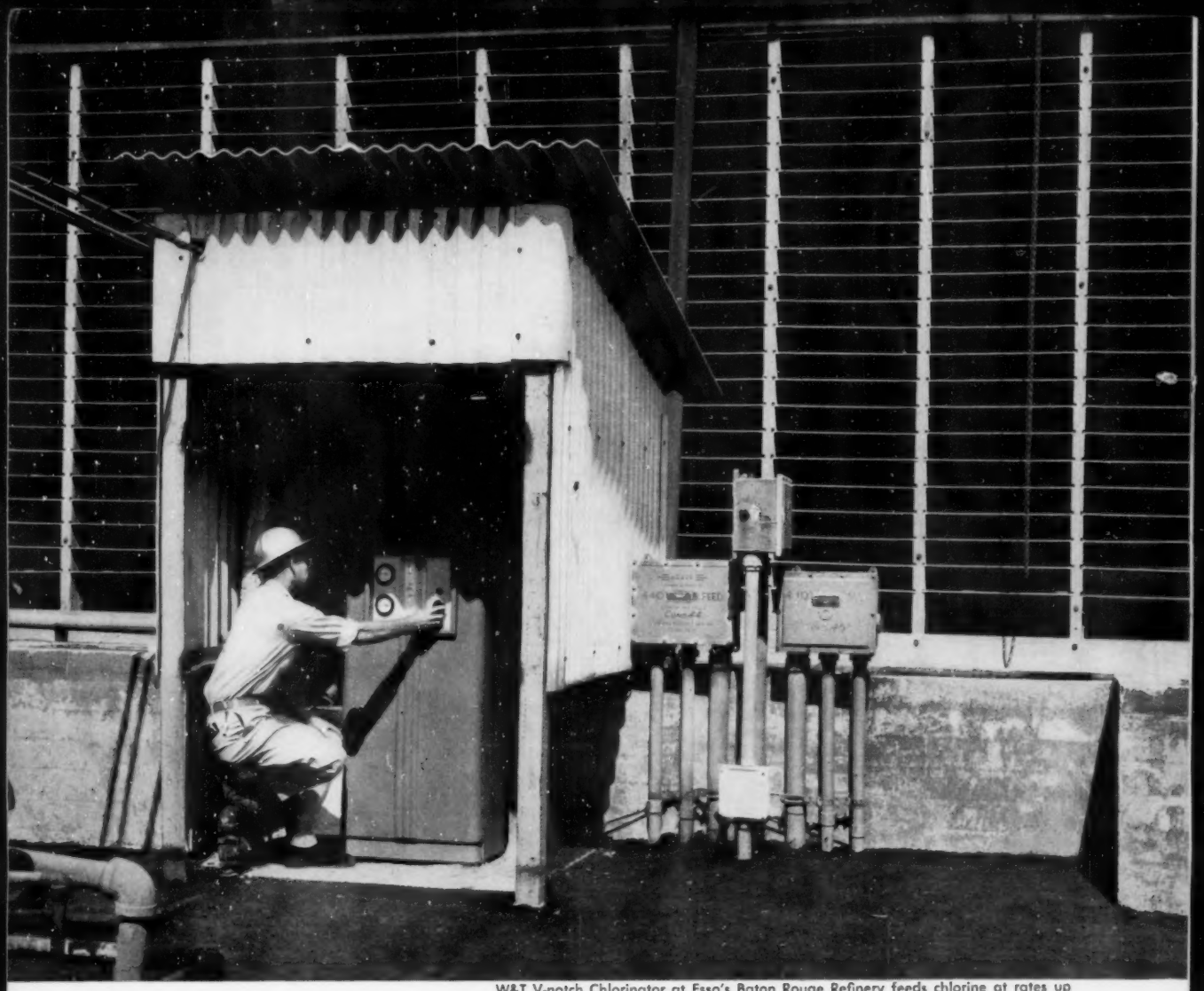
Freese, Nichols & Turner, Consulting Engineers, specified the most modern, master filter control system.

This system, for the City of Houston's recently completed $5,000,000 modern water purification plant that is now in service, must deliver top filter performance: maintain exact total flow despite changes in head in 8 filters; precisely measure flow rate, head loss; carefully control wash rates to protect beds; transmit all vital data to *one central control point*—with no lag, no hunting, no inaccuracies.

To meet these rigid requirements, Simplex flow controllers and instrumentation were selected. For dependable pipe-gallery operation, Simplex Laminair® units *pneumatically* transmit data to operating tables. For complete control of all the wide spread operating elements, Simplex Orthoflow® units *electrically* transmit data to one central point—instantly, accurately.

Your plant may achieve automated operation with minimum changes in present instruments and controls. Write for information. Simplex Valve & Meter Company, Dept. PW-3, 7 E. Orange Street, Lancaster, Pa.

SIMPLEX®
VALVE AND METER COMPANY



W&T V-notch Chlorinator at Esso's Baton Rouge Refinery feeds chlorine at rates up to 500 lbs./24 hr. over a 10 to 1 feed range. Other V-notch models are available with maximum capacities from 500 to 2000 lbs./24 hr. over a 20 to 1 feed range.

NEW W&T V-NOTCH CHLORINATORS

are rugged–easy to operate–moderately priced.

The W&T V-notch Chlorinator installed at the Esso Standard Oil Co. Refinery, Baton Rouge, La. is housed in a shed open to the sun, weather, and water spray drifting from a cooling tower. The average water or sewage treatment plant operator would consider this rugged service for any piece of equipment.

W&T V-notch Chlorinators have proven in this and other installations that they can withstand rugged service. The design of new V-notch Chlorinators uses not only modern corrosion proof materials but a new concept of chlorine gas control, the W&T V-notch Variable Orifice. V-notch Chlorinators are easy to operate and maintain. They provide the precise chlorine control that is expected from Wallace and Tiernan equipment. In addition, W&T V-notch Chlorinators are an attractive piece of equipment, colored soft green to fit into plant color schemes.

Ask your local W&T representative for more information about W&T V-notch Chlorinators or send for Bulletin S-113.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY